AIR CONDITIONING HEATING AND VENTILATING

FEBRUARY, 1956 – 53rd YEAR

Dust Control in School Shops—page 85

Centrifugal Pump Application—page 77

Hot Water Demand in Industry—page 89

Contents—page 3

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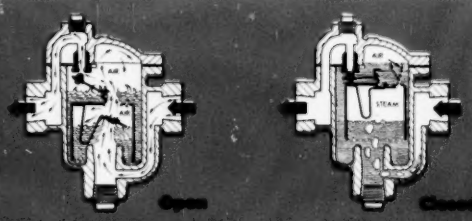
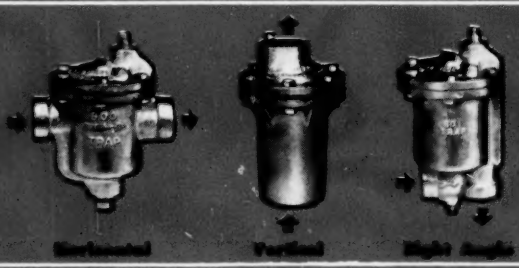


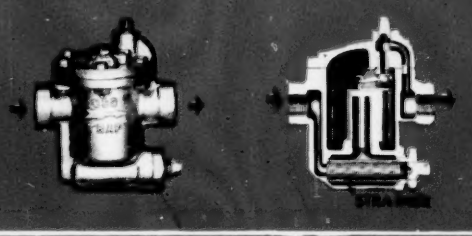
2. EASY INSTALLATION

Any pipe connection—horizontal, vertical or angle—available for the majority of installations to save time, labor and fittings.



3. INTEGRAL STRAINER

The four most commonly used trap sizes are available with strainers built-in to the body to save time, labor and money through faster installation with fewer fittings.



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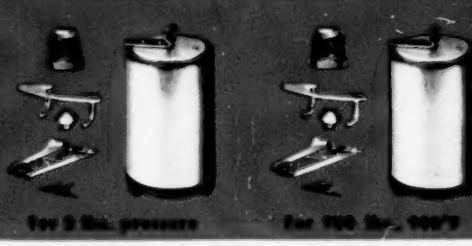

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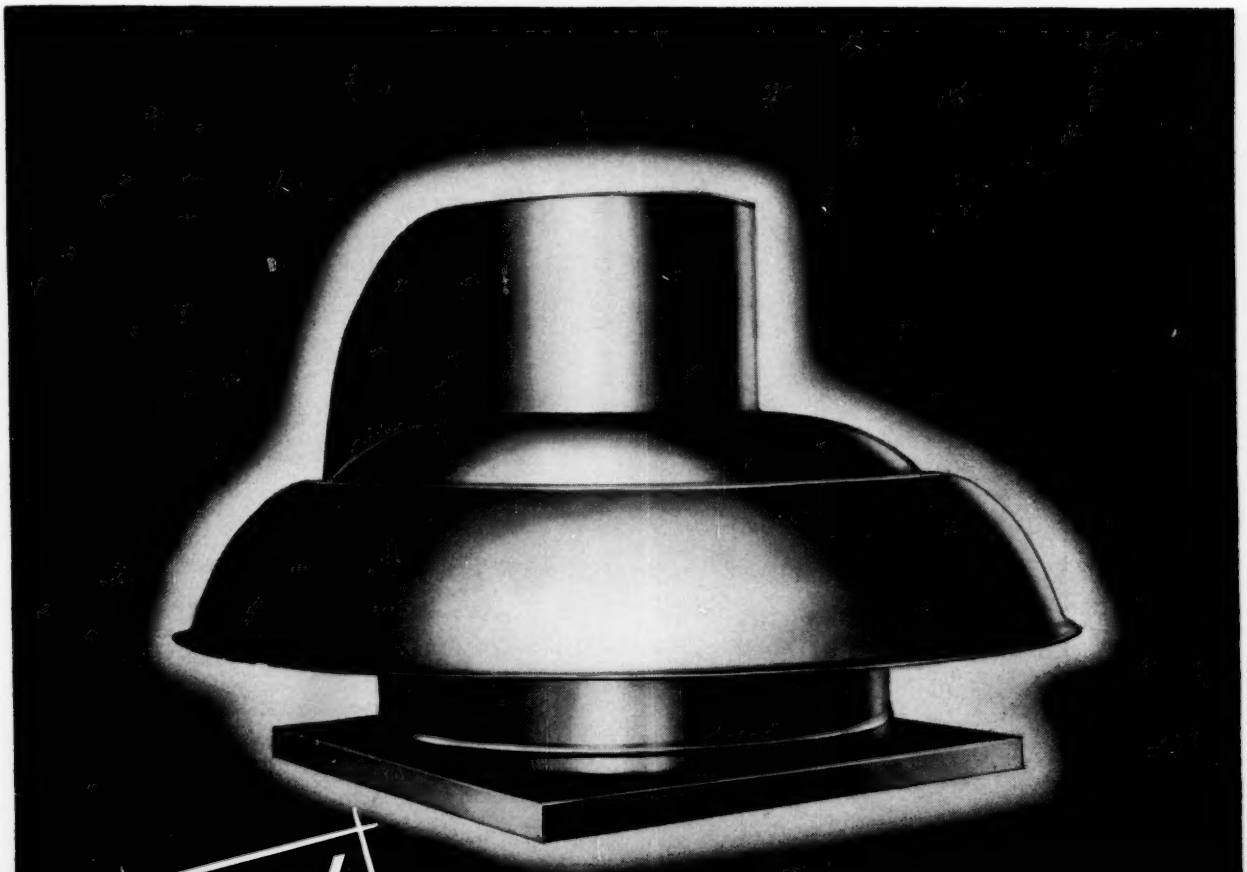

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AIR CONDITIONING HEATING AND VENTILATING

FEBRUARY, 1956

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CONTENTS

VOL. 53 No. 2

FEATURE ARTICLES

Centrifugal Pump Application—I. J. Karassik, R. Carter ... 77
Moisture Control Needed In Printing ... 81
Multiple Heat Pump Installations—G. L. Biehn ... 82
Air Conditioning Improves Powder Puff Manufacture ... 84
Dust Control for School Woodworking Shops—J. R. Kayse ... 85
Install Draftless Air Diffusers in New Ocean Liners ... 88
Recommendations for 275-Gallon Tanks ... 104
Air Pollution—W. W. Cook ... 107

REFERENCE MATERIAL

Section—Service Hot Water for Commercial and Industrial Use—F. M. Reiter ... 89
Detail Sheet—Piping for Industrial Oil Burners ... 105
Data Sheet—Dimensional and Capacity Data ... Opposite 174

DEPARTMENTS

High Spots ... 5
Washington Overtones—L. Overman ... 6
Briefly Stated ... 10
Piping and Plumbing—L. Blendermann ... 102
Temperature Forecast ... 109
Product Applications ... 110
What Would You Do? ... 112
News of Equipment and Materials ... 115
News of the Month ... 138
Degree-Days for December, 1955 ... 148
In the Field ... 152
Book Reviews ... 154
Ad-Digest ... 155
Canadian Degree-Days for November and December, 1955 ... 160
Coming Events ... 160
New Catalogs ... 164
Index to Advertisers ... 174

The Cover: Increasing attention to shop training courses in public and trade schools warrants engineered dust control at a professional level as in this woodworking shop at the Doylestown, Pa., High School. Photo by American Air Filter Co., Inc. See page 85.

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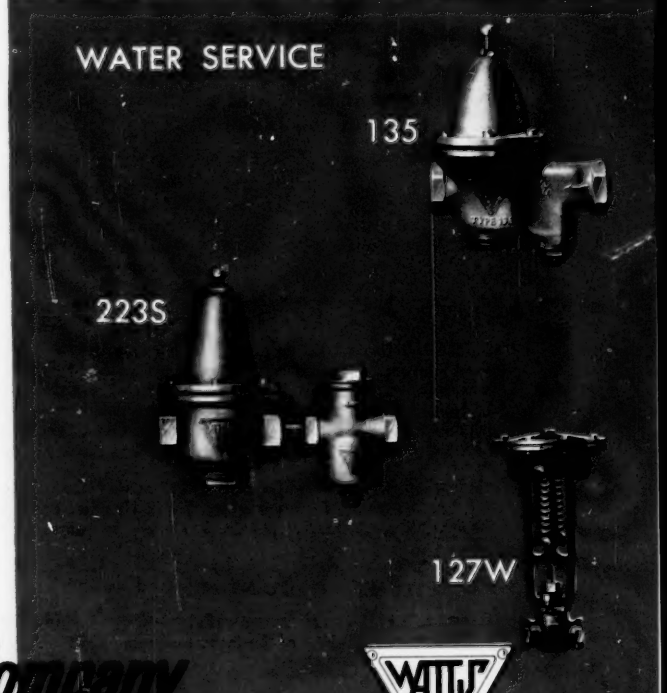

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HIGH SPOTS

• Most major industries will continue to operate **near peak levels** through the first six months of 1956, according to a BDSA year-end survey released by the Department of Commerce.

• **New construction** expenditures for 1956 are estimated by the Department of Commerce at $44 billion, **5% above** record 1955. Expenditures for stores and service establishments are expected to increase by 17% to $2.25 billion.

• An increase in **air conditioning equipment** sales of 15 to 20% is expected for the industry by D. C. Minard, president of The Trane Co.

• **A total retail volume** of $3.2 billion in air conditioning sales is expected for the industry by Cloud Wampler, president and chairman of Carrier Corp., with **biggest percentage gain** in the residential field.

• W. J. Olsen, president of Armstrong Furnace Co., expects the market for **summer air conditioning** installed by furnace men **to double in 1956.**

• The past year was the biggest in the history of the gas industry, and 1956 is sure to set **new all-time records,** says W. F. Rockwell, Jr., president of GAMA. Most members of AGA also predict another record year in 1956, according to Dean H. Mitchell, president.

• The **industrial production index** ought to be about 143 by June, 1956, compared with 139 for June, 1955, in the opinion of F. S. Cornell, executive vice president of A. O. Smith Corp.

• Year-end reports by OHI of 1955 **oil burner sales** show about 820,000 residential and 35,000 commercial units moved, with larger sizes showing definite increase.

• Many in the **copper industry** are expecting a **balance** between supply and demand during the first quarter of 1956, according to T. E. Veltfort, manager of Copper and Brass Research Association.

• The New York City Omnibus Corp. has ordered 100 **air conditioned buses** for use in Manhattan and Queens. First vehicles are to be delivered about April 15 for test operation. The company plans to have all 100 buses operating by the end of 1956.

• A regulation covering **licensing** of persons responsible **for handling** the controls of reactors and other **nuclear facilities** used in civilian industry were published in the Federal Register January 4 by AEC. Applicants must pass an operating test and written examination. There are no special educational requirements.

WASHINGTON OVERTONES

by LORING OVERMAN

Something king-size in **business promotions**—even for Washington—took place on January 16 in the Nation's capital. The event: **Operation Home Improvement.** Sponsors: half a hundred national trade associations and leading companies in the construction field.

Procedure: an all-day session at a leading hotel, climaxed by a luncheon for 500, with a 50-man head table occupied by a Cabinet officer, several Members of Congress, Treasury Department representatives, and members of the White House staff.

Principal speaker—U. S. Housing and Home Finance Administrator Alfred M. Cole.

Theme—launching of a national, year-long home improvement campaign built around the slogan "56—the year to fix."

USHHF Administrator Cole put it this way:

"Today the building and allied industries—with the continued cooperation of Government—are about to undertake an enterprise of tremendous scope and of a social import that cannot yet be measured.

"These industries are not only going to construct probably **1,300,000 new homes** in 1956, but they are going to improve very substantially **10 million or more existing dwellings** at a cost of over $9 billion. An additional 10 million or more homes will receive maintenance and repairs in excess of another $5 billion.

"The total will be about 25%, or **$3 billion, more** than was spent in 1955—and I believe it is a conservative estimate."

• The whole theory behind Operation Home Improvement is simple. It plays a novel overtone in the building field. Since before Korea, the emphasis in construction has been on new homes. As an overtone, Operation Home Improvement tunes in on another opportunity—the fact that besides the market for some 1-plus million new homes each year there are some **50 million older homes,** many of which could be modernized.

What could all this mean to the **air-conditioning, heating and ventilating industries?** A hint comes from a Federal Reserve Board study made last year. FRB pointed out:

——40% of all home owners spent nothing on home maintenance or improvement during 1955.

——Of those who spent anything, half spent less than $300.

——30 million homes in America today haven't been painted in 10 years.

——13 million have no bathtub or shower . . . 7 million have no kitchen sink . . . 7 million have no running water.

• In a proclamation launching Operation Home Improvement, the Federal Housing Administrator promised the cooperation of his agency. Concluding his address, Mr. Cole read the following portion of a letter from President Eisenhower:

"I hope that the Housing and Home Finance Agency can now join with communities, the building and lending industries, and private citizens in a nationwide effort toward this goal."

• At the conclusion of the Operation Home Improvement luncheon, the dozen or so Members of Congress present hurried to Capitol Hill where the 84th Congress, 2nd session, was tuning in on many political and legislative tones and overtones.

Of universal interest is the **Tax Outlook.**

Ups in taxes are in prospect for highway users, via an **increased gasoline tax,** to finance a new emergency highway program.

Downs seem likely for some **individual income taxes** in lower brackets, probably despite the President's contrary wishes. Popular possibilities—raising exemption to $700 from present $600; splitting first tax bracket (presently taxed at 20% of first $2,000) as follows: first $1,000 at 15%, second $1,000 at 20%.

Unchanged rates are anticipated for **corporations** (remaining at present 52% instead of dropping to 47% on April 30 as scheduled). Excise rates, also slated to be dropped on April 30, may be extended. Smaller business might possibly get a break through reversing present rates on corporate income—levying 22% on first

(*Continued on page* 8)

Make this Test

for Heat Flow in Buildings

Try this experiment. Take a piece of multiple accordion aluminum. *(We'll send you some free samples.)* Hold it very close to your cheek without touching. You'll be surprised! Notice how, in seconds, your cheek feels a glow of warmth. Why? Because the heat rays which are leaving your face (although without temperature), are being thrown back again at a 97% rate by this amazing insulation. Reflected to your cheek, the rays are now reabsorbed at a 90% rate and turned into heat.

THE BIG THIEF

The same thing happens in building spaces. This simple experiment illustrates an extremely important principle of heat flow. The greatest thief of fuel, of heat, and of comfort in buildings in winter, and of comfort and electricity for air-cooling in summer, is the flow of heat by Radiation.

Put multiple sheets of prefabricated accordion aluminum insulation inside wall and roof spaces, and you bar the path of this thief. For multiple accordion aluminum throws back, with 97% reflectivity, the heat rays that strike its surfaces. It also retards, most effectively, the flow of heat by Convection, Conduction, and Vapor Flow.

The tough aluminum sheets in multiple aluminum are almost completely impervious to water vapor, and are long and continuous. Infiltration under flat, stapled flanges is slight.

Where multiple aluminum is used, fortuitous vapor and water (for instance rain) which intrude into wall and similar spaces, will gradually flow out as vapor through exterior walls and roofs as pressure develops within, because vapor flows from areas of greater to less density. The vapor cannot back up through the continuous, almost completely impervious aluminum, so it flows *out* because exterior walls and roofs have substantial permeability compared to aluminum, far greater than the required 5 to 1 ratio.

For maximum uniform depth protection against heat loss and condensation formation, use **edge-to-edge** multiple aluminum,* **each** sheet of which automatically stretches from joist to joist.

*Patent applied for.

How thermal losses can be reduced by successive sheets of metal and air layers is described in the booklet, "Insulating Effect of Successive Air Spaces Bounded by Bright Metallic Surfaces" published by the American Society of Heating and Air-Conditioning Engineers. This report is well worth reading. Obtain it free—Send the coupon.

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WASHINGTON OVERTONES (*Continued from page 6*)

$25,000 (instead of 30% as at present) . . . then 30% on amounts over $25,000.

New tax proposals are suggested now and then on Capitol Hill, but not too seriously. In an election year such increases are not regarded as among the better methods of winning votes.

Meanwhile tax receipts are reportedly far beyond estimates and by midyear, both sides of the Congressional aisle may be anxious to share the "honor" of reducing taxes on voters' incomes.

About Construction:

• **GI Housing benefits** are about to **expire,** but it's unlikely that Congress will permit that to happen in an election year. Some restrictions may be eased, but no-down-payment loans are considered unlikely in future legislation.

• President Eisenhower recommended to Congress a **school program** with many overtones for the air-conditioning, heating and ventilating industries. Requested is authority for a five-year $2 billion federal aid school construction program to help overcome an increasing shortage of classrooms.

Once the shortage is overcome, the President emphasized, the federal grant program **can and must terminate.** The President's recommendations were embodied in S2904 (Smith and Case, N. J., and Duff, Pa.).

• **Total spending** for new construction in 1955 reached $42.25 billion, establishing an **all-time record** for the ninth consecutive year. Outlays for the entire year, including both public and private building, ran 12% ahead of 1954. Largest single factor—residential.

• 1956 is expected to set another record, at about $44 billion. Biggest gain is looked for in public construction.

• There are developments forecasting the increasing importance of **atomic power:**

——HR 7993, Representative Carl Vinson's bill outlining a shipbuilding program for the Navy for 1957, includes provisions for: six **nuclear-powered submarines;** no subs with conventional power. Also requested is authority for one nuclear-powered **guided missile cruiser.**

——Atomic Energy Commission has issued new regulations removing some of the restrictions on the **sale of radio-isotopes** abroad, and simplified procedures governing domestic distribution.

• **Project Jules Verne** continues to discuss the unusual in terms of the commonplace:

——The Nike **guided missile project,** once an almost unbelievable dream on a drawing board, is now calling for authority to lease 750 family housing units near several major cities. Under the rules, housing for families of Nike batterymen, must be within 10 minutes of combat stations. These are usually in isolated areas where little housing is available.

——Navy plans conversion of 10 more ships for **radar picket duty;** conversion of a submarine to guided missile armament, and an escort carrier to a **helicopter assault ship.**

Operation Politics requires that every business, every industry, keep its eyes on Washington between now and adjournment of the 2nd Session, 84th Congress.

• Both sides of the political aisle are strongly aware of the vote-getting possibilities of **special legislation.** Trouble is, each "special" costs money, either in added expense, or reduced revenue. Either way, the business **tax-payer stands to lose,** for emphasis is on relief for the individual voter.

• Legislative programs of both parties are similar, varying only in degree. This being so, one is likely to try to outdo the other in making **tempting offers to voters.** Result, bigger and costlier government at the conclusion of the current session, unless Members of Congress are made aware that constituents really insist upon economy **—if they do.**

One observer puts it this way:

"The special pleaders are likely to have a field day in Washington unless businessmen and other responsible citizens of every community spread the facts—aims, probable results, cost to taxpayers etc.,—about the basic issues before Congress. They will also want to express their informed opinions to their representatives in Congress."

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BRIEFLY STATED

• The Baltimore Aircoil Co. recently announced the appointment of W. E. Kahlert as vice president in charge of sales. Mr. Kahlert has been with BAC for approximately one year and will direct the company's sales and advertising program. He is a graduate of the University of Minnesota and was formerly associated with the Trane Company and McQuay, Inc. R. R. Forseille will assume the responsibility of the factory operation and supervise the company's purchasing in the capacity of vice president in charge of production. Mr. Forseille also will handle the planning and construction of the new BAC factory to be built on a 20-acre plant site recently acquired.

• Maurice Eastin has been named manager of sales for the Perfex Division of the General Controls Co. Mr. Eastin had been sales manager of Perfex Controls until General Controls acquired the controls division of the Perfex Corporation of Milwaukee to broaden its line of oil-fired control equipment.

• Lauren E. Seeley is devoting his full time to The H. B. Smith Co., Inc., century old producers of cast iron boilers in Westfield, Massachusetts. Mr. Seeley was elected vice president, engineering, of H. B. Smith in June, 1955. He has served as both engineering consultant and a director of the company for many years. Mr. Seeley has been serving as Dean of the School of Technology of the University of New Hampshire prior to his joining H. B. Smith on a full time basis. He has been known actively both as a consultant to manufacturers and government, as well as in educational circles. He has been author and co-author of more than a dozen technical papers, holds patents on several heating developments, and is a past president of ASHAE.

• United States Air Conditioning Corp., of Minneapolis, has contracted to purchase for cash all the outstanding stock of Jordon Refrigerator Co., of Philadelphia. Jordon manufactures commercial and home refrigerators and freezers, employing 300 persons in its newly-completed 102,000 square foot plant. No changes are planned in the present operations or personnel of Jordon.

• As its fourth major acquisition within six months, Walworth Co. has completed purchase of all of the outstanding common stock of the Conoflow Corp., Philadelphia, producer of pneumatic automatic valve control equipment. Conoflow will be operated as an independent subsidiary without change in management, employees or present policy.

• Howard B. Steggall has been elected president of Detroit Brass & Malleable Co. Mr. Steggall has been until recently senior vice president of National-U. S. Radiator Corporation.

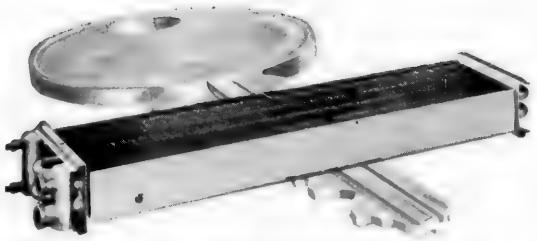
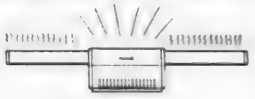
• H. Thomas Hallowell, Jr., president, Standard Pressed Steel Co., Jenkintown, Pa., has been elected president of the American Standards Association. Van H. Leichliter, vice president of operations of American Steel and Wire Division of United States Steel Corporation, Cleveland, was elected vice president of the Association.

• Warren Webster & Company, Camden, N. J., manufacturer of heating systems and equipment, has announced the return of Warren Webster to the office of president, effective December 1. That office has been vacant for the past two years, during Mr. Webster's absence in Washington, where he has been serving as director of procurement and production policies, in the office of the assistant secretary of defense for supply and logistics. The board of directors of Warren Webster & Company also announced the election of Arnold Richard Webster as executive vice president. In addition, the board announced the resignation of Andrew B. Young, junior vice president, and the coming retirement at the end of the year of E. Kessler Webster, senior vice president.

• George B. Moseley, of Akron, Ohio has been appointed vice president in charge of sales for Chase Brass & Copper Co., Inc., a subsidiary of Kennecott Copper Corp. Mr. Moseley, age 39, comes to Chase from the Firestone Steel Products Co. of the Firestone Tire & Rubber Co., Akron, O., where for the past seven years he has been general sales manager. Earlier in his business career he was chief service engineer for Jack and Heintz, Incorporated, in Bedford, O., and served Lincoln Electric Company, Cleveland, in a sales capacity. From 1946 to 1949 he was sales manager of the Contract Manufacturing Division of the Hupp Corp., Cleveland.

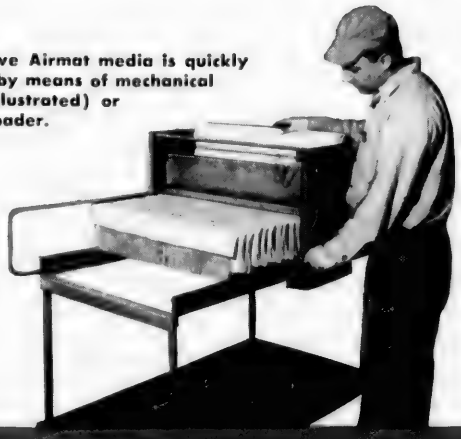
• Four executive appointments and a retirement have been announced by Robertshaw-Fulton Controls Company. Woodford D. Miller, vice president and the general manager of the Robertshaw Thermostat Division, has been made executive vice president in charge of the company's eastern operations. Mr. Miller is a veteran of nineteen years' service with the company and is a mechanical engineering graduate of the University of Tennessee. He will be located at the executive offices in Greensburg, Pa. Frank H. Post, assistant vice president, succeeds Mr. Miller as vice president and general manager of the Robertshaw Thermostat Division. Mr. Post has been with the company eighteen years and is a mechanical engineering graduate of Marquette University. George Mertz has been appointed assistant to the general manager of Robertshaw Thermostat Division and will be in charge of manufacturing at that division. Jean V. Giesler, an executive vice president of Robertshaw-Fulton, has retired as general manager of the Fulton Sylphon Division after almost forty-three years of continuous service. Mr. Giesler will continue to serve as a consultant for the company. Freeman G. Cross, vice president, will succeed Mr. Giesler as general manager of the Fulton Sylphon Division. Mr. Cross has been with the company twenty-eight years. He is a graduate of the United States Military Academy at West Point.

• Arthur S. Klopf has been appointed manager of marketing for American Gilsonite Co., Salt Lake City, Utah. Mr. Klopf will direct all sales and marketing activities of the company including products from their new gasoline refinery and metallurgical coking plant now being erected near Grand Junction, Colo. Mr. Klopf was formerly general sales manager of the Missouri Coke and Chemical Division of the Great Lakes Carbon Corp.

The key  **to the economy of the Nesbitt Series Wind-o-line System of Classroom Heating and Ventilating** is the Nesbitt Syncretizer's new hot-water heating element which delivers the required amount of heat by multipassing a much smaller quantity of high-temperature water than is circulated by conventional systems This means that the system may be designed for greater than the usual water temperature drops and therefore only one-half to one-third the normal amount of hot water need be circulated. This means that smaller pipes and smaller pumps are used. The copper tubing of the Wind-o-line Radiation serves as the supply and return piping for a group of classrooms or an entire wing and eliminates expensive mains and pipe trenches The Wind-o-line tubing is used as finned radiation along cold walls and windows to give the needed protection against downdraft  This arrangement also eliminates much costly pipe covering As a result of these savings plus the installation economies of factory-fitted piping within the unit ventilator, your school enjoys a new standard of classroom comfort at savings of up to 20% of the construction, equipment and installation costs of conventional heating and ventilating systems employing trenches and runouts.

Made and Sold by John J. Nesbitt, Inc., Philadelphia 36, Pa. Sold also by American Blower Corporation. Send for Publication 104.

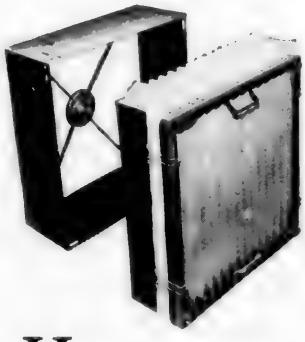
Operator demonstrates simple removal of Electro-PL filter element for servicing.



Inexpensive Airmat media is quickly renewed by means of mechanical loader (illustrated) or manual loader.

TWICE THE EFFICIENCY
of ordinary filters
AT LOW INITIAL COST

Rear view of Electro-PL installation showing electrical connections to individual cells.

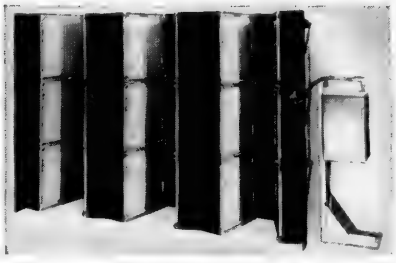


The only filter that effectively combines Dry Filtration with Electronic Action!

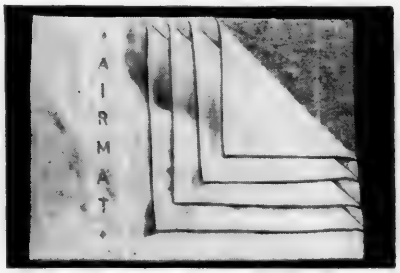
HERE'S the one and *only* air filter designed specifically for use where better-than-normal air cleaning is needed at lowest possible cost.

The Electro-PL employs electronically-charged Airmat media. And with every renewal of the media, the Electro-PL becomes essentially a new filter. Unit construction simplifies installation —no water or sewer connections.

Even a power failure can't stop *this* electrostatic filter! The Airmat media alone will maintain efficient air filtration. For complete product information, call your nearby AAF representative or write direct for Electro-PL Bulletin 257.



Electro-PL units may be installed in space-saving V arrangements.



5 ply Airmat filtering media is composed of porous, tissue-thin sheets of cellulose fibers.

AAF Dust Control Equipment

Illinois Steam Heating Specialties

AAF
Herman Nelson

American Air Filter
COMPANY, INC.
294 Central Avenue, Louisville 8, Kentucky
American Air Filter of Canada, Ltd., Montreal, P. Q.

BETTER AIR IS OUR BUSINESS

Herman Nelson Unit Heaters

Herman Nelson Unit Ventilators

Electronic control of commercial air conditioning is only seven years old, yet already it has set new standards in operating economy and convenience. Why? The answer lies in the basic advantages of the electronic system. They're presented here as another in a series of reports from the pioneer manufacturer of electronic controls.

The Electronic Revolution in commercial

Honeywell electronic Supervisory Data-Center permits complete management of air conditioning systems from a single point. This is centralized control — now practical and economical for installations of any size.

Honeywell Electronics
Report Number Two

As MODERN standards of indoor comfort become more refined, they demand year-round air conditioning plants of increasing complexity.

This is costly equipment. It must pay off in terms of efficient, economical operation. Hence the mounting interest in controls — most vital accessory the air conditioning system can have.

When Honeywell developed the electronic thermostat in 1949, it was possible at last to have a control installation that met every demand of architects, engineers and building managers.

For with electronics, *central control* comes into its own as a tool for getting the most out of the air conditioning system. The Supervisory Data-Center, an electronic panel, gives one man supervision over the entire system from one control point. The result is an entirely new kind of convenience and efficiency that means savings—*big* savings—in several important ways.

Take the case of the modern skyscraper, such as the huge new Mid-America Home office of the Prudential Insurance Company in Chicago. With a conventional control installation, this building's 203 thermostats could require the services of full-time maintenance men for operational checks alone.

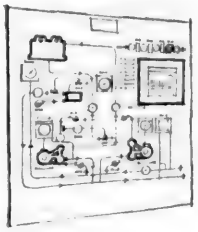
Not so with the Prudential's electronic installation. From a central location, one man can make a one-degree adjustment in the comfort level of a space 20 floors away, if needed. His control is based on complete information supplied by the Supervisory Data-Center, where it's displayed visually for analysis and interpretation.

Another example is in the new quarters of *The Houston* (Texas) *Post*. Here, a Honeywell electronic panel automatically oversees the entire 400-ton cooling plant's operation. Visual display of performance data permits convenient, instantaneous review of component function, indicating any adjustment needed.

Instrumentation's Role

Honeywell instrumentation, built into the central panel, is the ultimate refinement that stamps the electronic control installation with the mark of superiority.

For by combining Honeywell-made instruments with Honeywell electronics, engineers are able to achieve certain advantages that assure control efficiency never before realized.



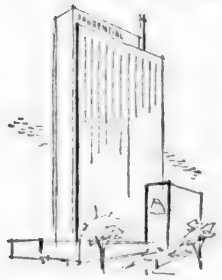
Typical Honeywell Electronic Panel

air conditioning

Precision indicators *at the panel*—the eyes of the central panel—show temperatures throughout the system. Through electronics, control points can then be adjusted remotely with unusual accuracy. Only electronics makes economically feasible such a convenient combination of data visualization *and* control point adjustment at a spot remote from the controlled equipment. It's this combination that affords the precise control needed to avoid costly overheating or overcooling.

Instruments also permanently record performance of heating and cooling components, providing precise data for efficiency studies.

Other Important Benefits



Mid-America Home Office, The Prudential Insurance Company, Chicago

Valuable as it is, central control is only one of the advantages that's proving the benefits of the electronic installation. Another is automatic sequencing, which only electronics makes fully practical for any commercial system.

With electronics, automatic sequencing is *convenient:* the *same* thermostat may sequence from heating to full ventilating to mechanical cooling. It's *effective:* it utilizes the thermostat's full operating range. It's *economical:* automatic use of outside air to carry part of the cooling load cuts refrigeration costs.

With electronics, use of *averaging* thermostats—although no substitute for adequate zoning—is no longer costly and complicated. In controlling an open area as a single zone, for example, it's simple to locate inexpensive electronic thermostats so that load changes peculiar to the enclosure's equipment or occupancy are sensed and averaged out, maintaining a constant comfort level.

Compensation Greatly Improved

Faster, more accurate, more stable compensation is achieved through electronics. Especially valuable for short-occupancy spaces such as retail stores, this feature also prevents discomfort due to variations of wind and sun effects or sudden changes in outdoor temperature. Automatic winter-summer reset, utilizing an outdoor thermostat, cures temperature drift in winter, air-cooling shock in summer. This means *consistent* comfort in any building, in any weather.

The Houston Post, Houston, Texas

No specialist is needed for installing and servicing electronic controls. Wiring is low voltage, with standard color coding easily understood by any heating and air conditioning technician. Today's installations will be up-to-date for many years to come. Maintenance and equipment aging problems are minimized, because the electronic thermostat contains no moving parts.

Key Word: Flexibility

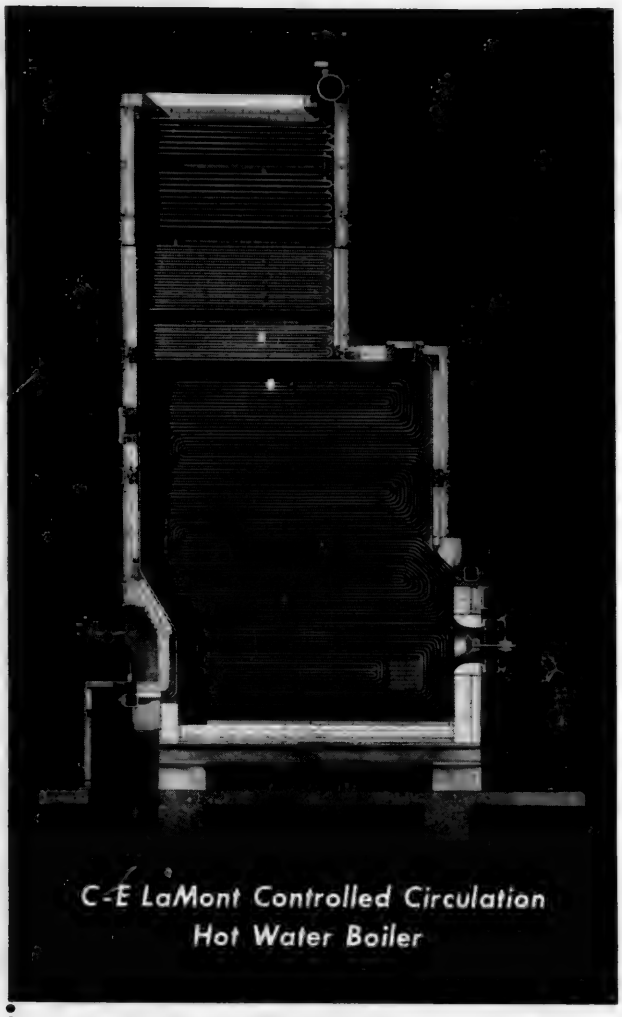
These advantages are summed up in one word: *flexibility*. It means that all or any combination of the electronic installation's features are readily adaptable to the solution of any control problem. The results are better, more efficient, more convenient operation of the air conditioning system—and important dollar savings.

In fact, it's *flexibility*—in the entire field of temperature control—that helps establish clearly Honeywell's leadership. For only Honeywell makes *all three types* of control systems: pneumatic, electric, electronic, each with distinctive advantages for certain applications. Thus only Honeywell is able, with complete objectivity, to help you select the one system shaped perfectly to the needs of the building and its occupants.

• • •

Ask for our new electronic control booklet which tells more fully how to apply electronics to your control problems. Write Honeywell, Dept. 1003, Minneapolis 8, Minn.

Minneapolis-Honeywell Regulator Company



C-E LaMont Controlled Circulation
Hot Water Boiler

EVER CONSIDER HIGH TEMPERATURE WATER FOR YOUR HEATING AND PROCESSING NEEDS?

Both steam and high temperature water have their place, and your particular requirements will determine which is best for you. In either case, the complete C-E line includes a type and size of boiler exactly suited to your needs. Where high temperature (HT) water seems indicated, it affords such important advantages as:

1. The higher available heat in HT water — many times that of steam at the same pressure.
2. Closer control of temperature.
3. Heat loss is lower with the HT water closed system . . . unused heat return lines.
4. No elaborate requirements
5. Steam traps n expense are e
6. No blowdown no condensate

The planning of any tem should include the water system. There installations operating ber in the U.S.A. It ma

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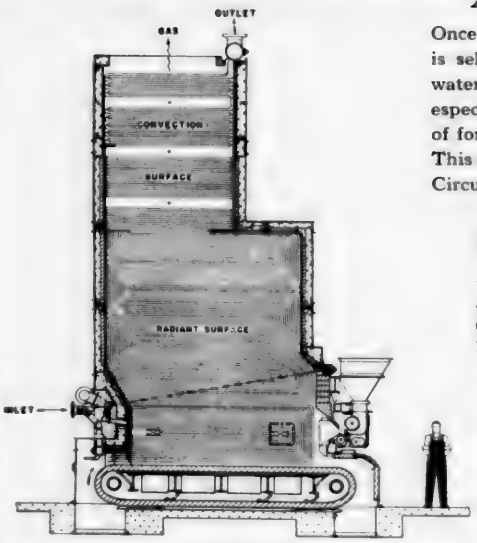
Advantages of the C-E "



Once it is established that HT water is right is selection of proper equipment. The C-E high pressure, high temperature water boiler has inherent advantages that make it the best possible choice. It is especially designed for HT water applications utilizing as it does the principle of forced, controlled circulation which is extended throughout the entire sytsem. This accounts for numerous points of superiority in the C-E LaMont Controlled Circulation Hot Water Boiler. Among these are:

1. Complete control over HT water movement in both system and boiler.
2. No separate boiler pump is required, since low pressure loss is inherent.
3. Pressurized operation with oil or gas means no induced draft fan.
4. Single-pass design — no baffles — means cleaner boiler and lower draft loss.
5. More efficient heating surface can be arranged because of controlled, positive circulation.
6. Any fuel — oil, gas, coal, or any combination of fuels.
7. Other features such as: gastight, welded steel casing . . . fewer headers, all of which are accessible.

The C-E LaMont Controlled Circulation Hot Water Boiler is available in sizes ranging from 10 to 200-million Btu per hour, or more, with pressures up to 500 psi and temperatures to 475 F — higher if required.

If you are in the market for a heating or process system — or expect to be — by all means investigate high temperature water and the C-E "HT" Water Boiler. Our engineers will be pleased to discuss the subject with you or your consultants. Write for our new catalog HT- 202.

COMBUSTION ENGINEERING

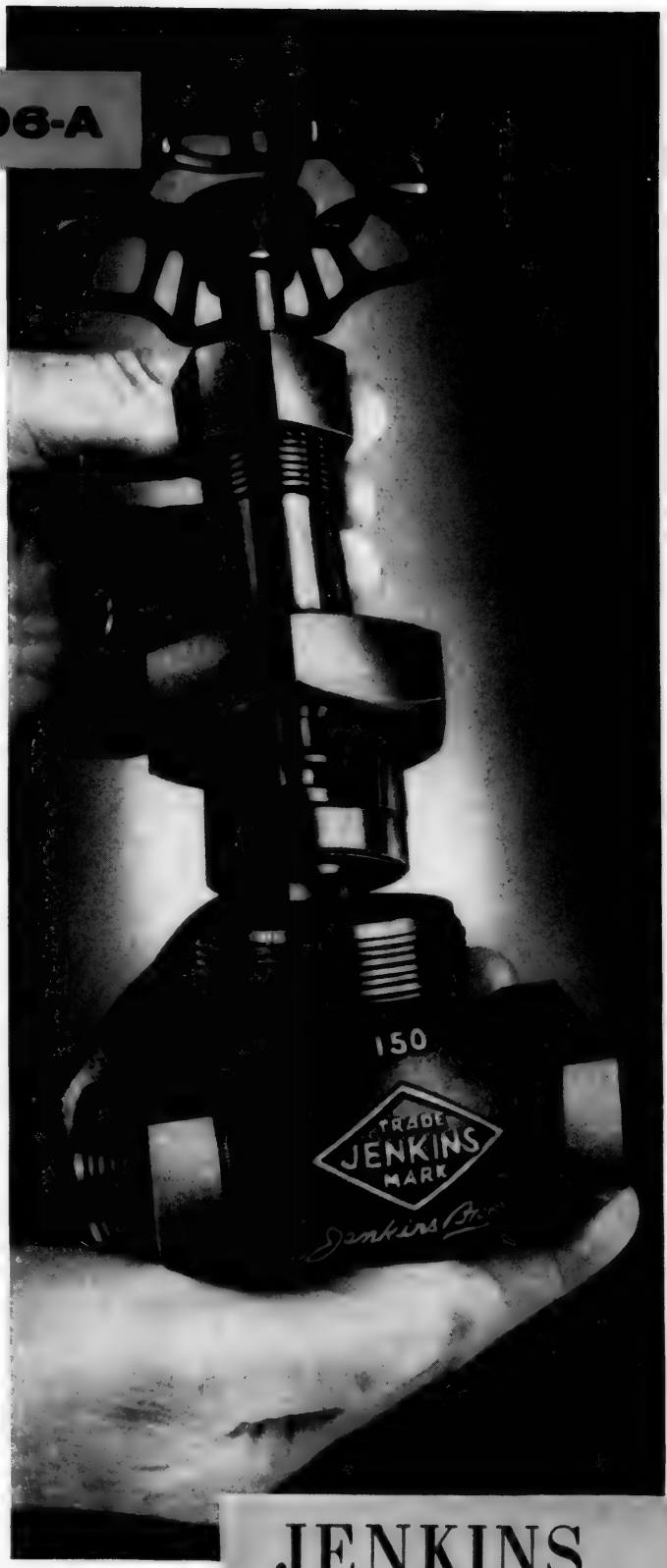
Combustion Engineering Building • 200 Madison Avenue, New York 16, N. Y. B-886-B

CANADA: COMBUSTION ENGINEERING-SUPERHEATER LTD.

STEAM GENERATING UNITS; NUCLEAR REACTORS; PAPER MILL EQUIPMENT; PULVERIZERS; FLASH DRYING SYSTEMS; PRESSURE VESSELS; DOMESTIC WATER HEATERS; SOIL PIPE

JENKINS Fig. 106-A

The FIRST
Renewable Composition Disc
BRONZE GLOBE VALVE
150 lbs. Steam 300 lbs. O.W.G.
⅛ in. to 3 in.



Making a
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ES 17-20

NUMBER ONLY

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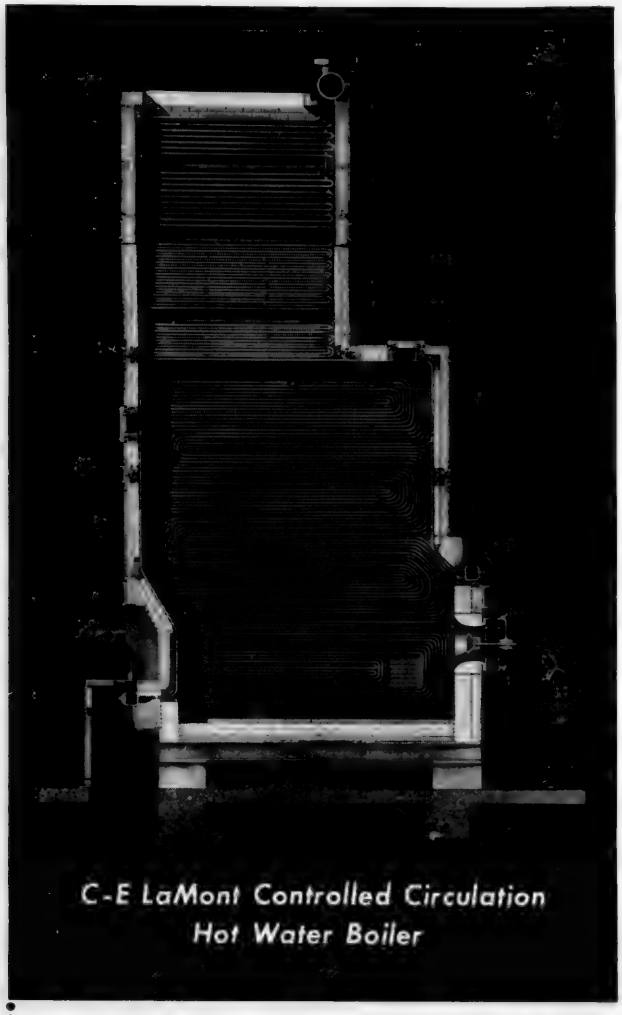
keep record has always set the standard. That is the true measure of valve cost — and it is the reason why industry's shrewdest buyers will settle for nothing less than Fig. 106-A quality.

The Fig. 106-A "family", with interchangeable parts, provides Globe, Angle, and Check patterns to meet 90% of average valve needs.

Ask your Jenkins Distributor for full information, or write: Jenkins Bros., 100 Park Ave., New York 17.

JENKINS VALVES

SOLD THROUGH PLUMBING-HEATING AND INDUSTRIAL DISTRIBUTORS



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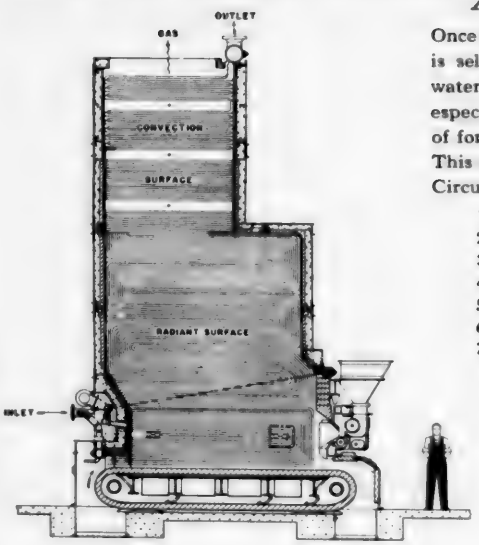
1. The higher available heat in HT water — many times that of steam at the same pressure.
2. Closer control of temperature.
3. Heat loss is lower with the HT water closed system . . . unused heat returns to the boiler . . . no condensate return lines.
4. No elaborate feedwater treatment required. Make-up requirements are exceptionally low.
5. Steam traps not required — trap problems and attendant expense are eliminated.
6. No blowdown losses . . . no safety valve vent losses . . . no condensate losses.

The planning of any new heating and/or processing system should include the consideration of a high temperature water system. There are many hundreds of HT water installations operating abroad and a rapidly growing number in the U.S.A. It may be *just right* for *your* requirements.



Advantages of the C-E "HT" Water Boiler

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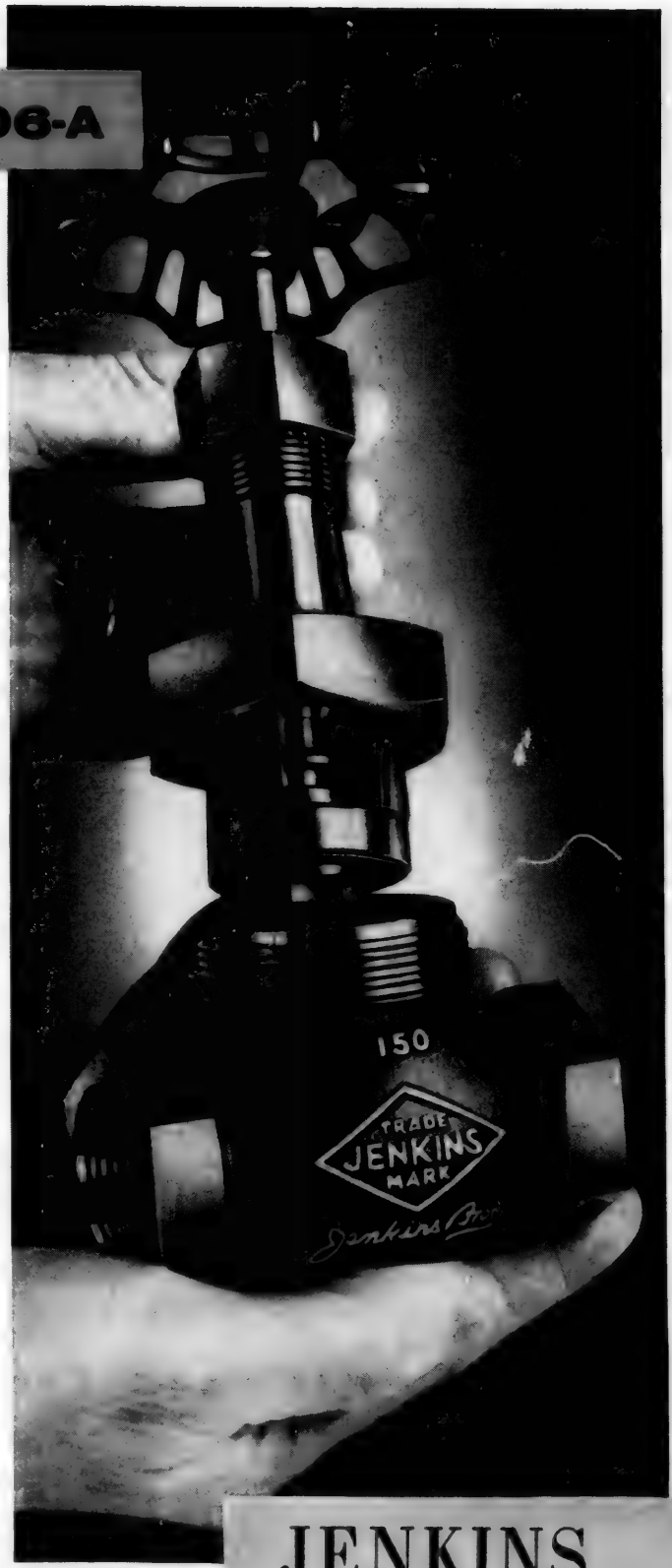
JENKINS Fig. 106-A

The FIRST
Renewable Composition Disc
BRONZE GLOBE VALVE
150 lbs. Steam 300 lbs. O.W.G.
⅛ in. to 3 in.



Making a Work Horse a Champion

Take a Fig. 106-A apart. It's easy to see the reason why it's the "champion" of disc-equipped Bronze Globes. Every part, from heatproof handwheel to pipe ends, reflects the design and construction skill of generations of Jenkins Valve specialists.

Jenkins Bros. introduced the first renewable composition disc Globe . . . is still the only manufacturer of both valves *and* discs.

Fig. 106-A not only looks better — it proves out better in performance. In any comparison, its long-life, low-upkeep record has always set the standard. That is the true measure of valve cost — and it is the reason why industry's shrewdest buyers will settle for nothing less than Fig. 106-A quality.

The Fig. 106-A "family", with interchangeable parts, provides Globe, Angle, and Check patterns to meet 90% of average valve needs.

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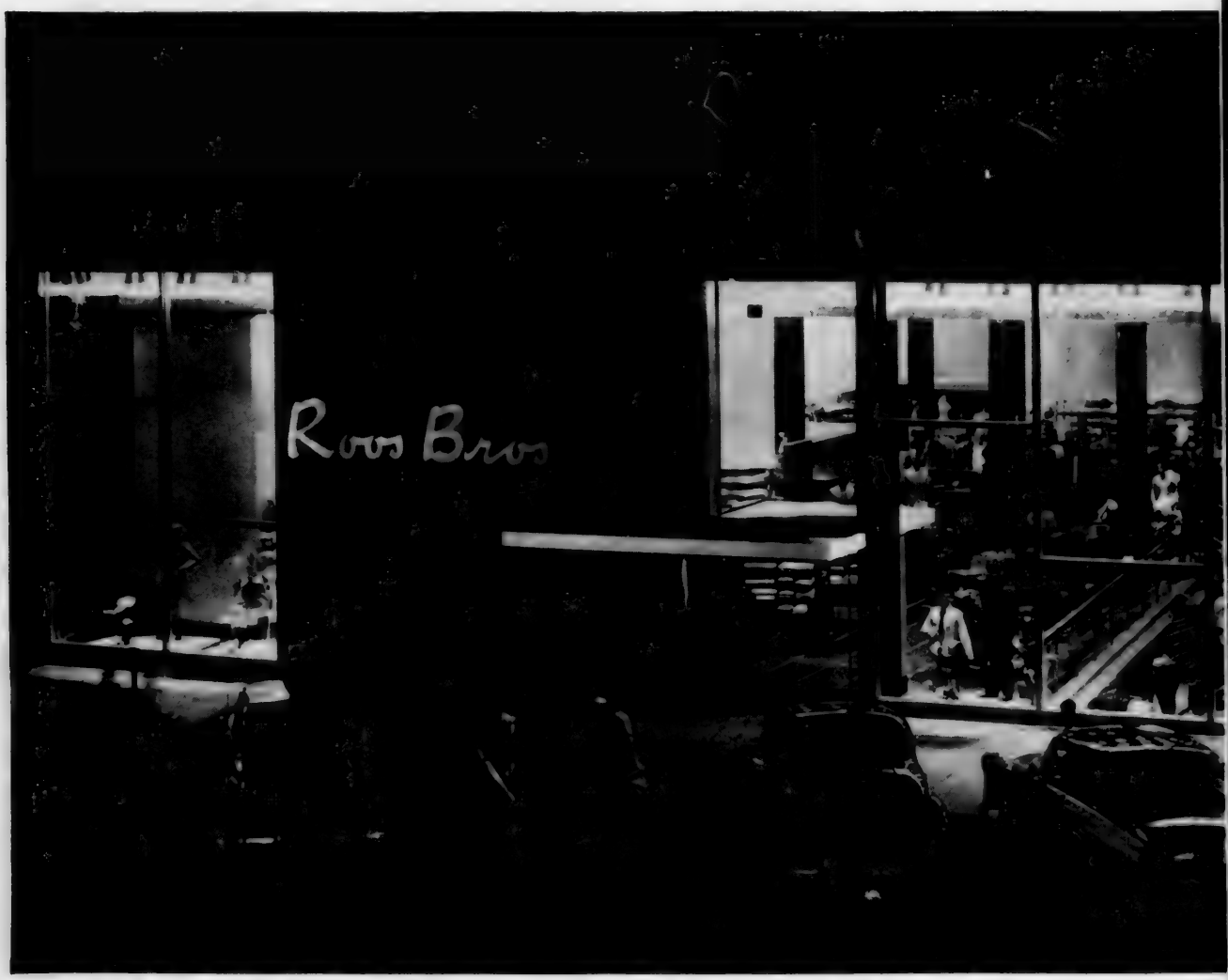
JENKINS
LOOK FOR THE JENKINS DIAMOND
VALVES
SINCE 1864 TRADE JENKINS MARK
Jenkins Bros

SOLD THROUGH PLUMBING-HEATING AND INDUSTRIAL DISTRIBUTORS

Comfort story of a modern apparel shop

How Honeywell Electronics makes Air Conditioning



Roos. Bros. clothing store, San Mateo, Calif. Architect representing Roos Bros.: Welton Becket, F.A.I.A., & Associates (San Francisco office). Architect-engineer representing Parrott Investment Co.: W. P. Day, San Francisco. Air Conditioning contractor: York Corp. (San Francisco office).

Dramatic three-level plan of Roos Bros. store provides maximum floor area with no feel of crowding.

Major advantages of its Honeywell Electronic Customized Temperature Control system are:

. . . ***big savings on cooling***—outside air is used automatically to help cool the store, cutting costs of mechanical refrigeration.

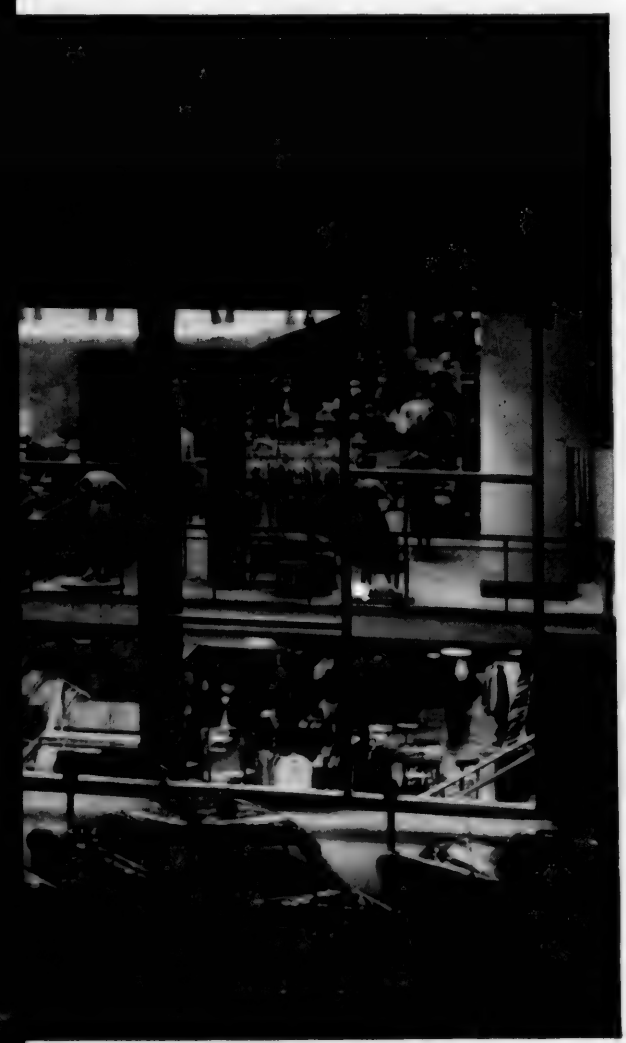
. . . ***from heating to ventilating to cooling,*** comfort is controlled automatically by a single thermostat.

. . . ***an outdoor thermostat*** anticipates weather changes winter and summer, prevents air-cooling shock and winter chill.

. . . ***system on-off switches*** are conveniently located right in the manager's office.

Added up, these features mean maximum comfort with maximum convenience, efficiency and economy.

Systems work better for less money



Now you can give any client ideal comfort, big-system conveniences at lowest cost— with Honeywell Electronic Temperature Control

A few years ago, stores like this one—a smart new Roos Bros. apparel shop in San Mateo, Calif.—had to make do with second-rate indoor comfort.

Why? Because good air conditioning performance depends on good control. And it took the recent development of Honeywell Electronics to make the *best* air conditioning control economically feasible for installations of moderate size.

Before electronics, for example, smaller installations for which a pneumatic system was too expensive had to depend on electric controls—fine for certain applications, but lacking flexibility for meeting varying load requirements of a retail store.

Having acted on wise analysis and guidance in their choice of a control system, Roos Bros. management enjoys many big-system benefits from the store's heating-cooling plant—benefits that only Honeywell Electronic Customized Temperature Control can provide at sensible cost. Explained briefly above, they result in an ideally comfortable shopping environment in which customers are likely to stay longer, buy more.

These benefits suggest some of the ways Honeywell Electronics can help you give your clients unprecedented comfort, convenience, economy—in heating, ventilating, air conditioning and industrial control, in any building, new or existing.

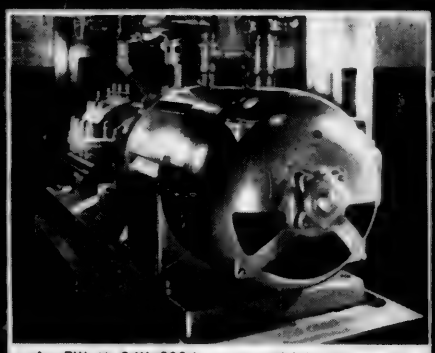
Call your Honeywell office for a new booklet that tells more fully how to apply electronics to your clients' control problems—and for information on the economical Periodic Maintenance Plan. Or write Honeywell, Dept. HV-2-11, Minneapolis 8, Minn.

MINNEAPOLIS **Honeywell**

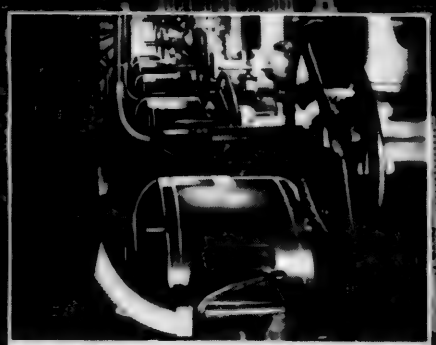
Electronic Controls

112 offices across the nation

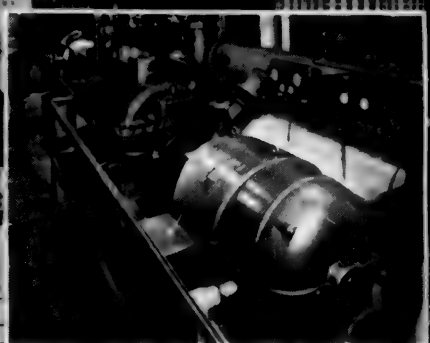
Bringing man-made coolness



An Elliott C-W 200-hp motor driving the main fire pump in a large New York skyscraper.

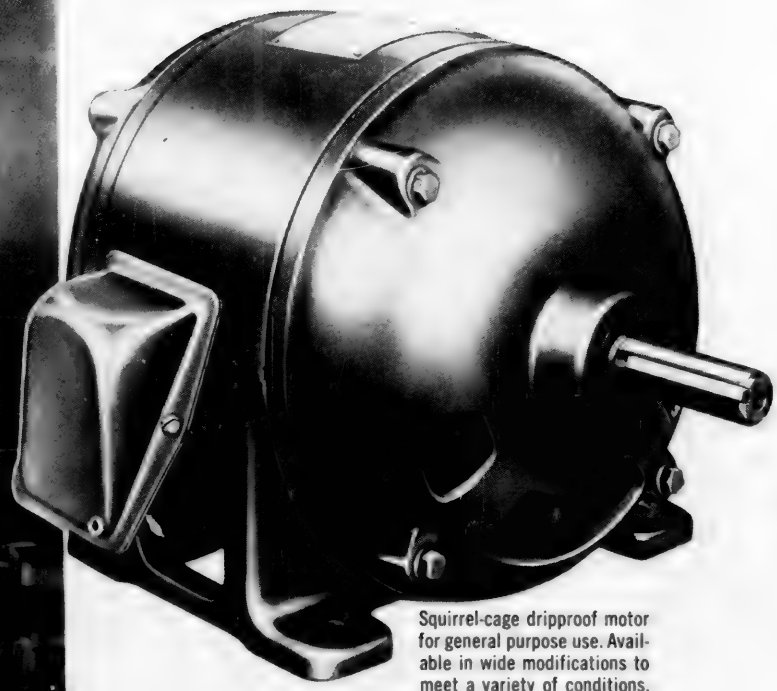


Three 50-hp and two 40-hp Elliott C-W motors driving pumps in a famous New York office building.



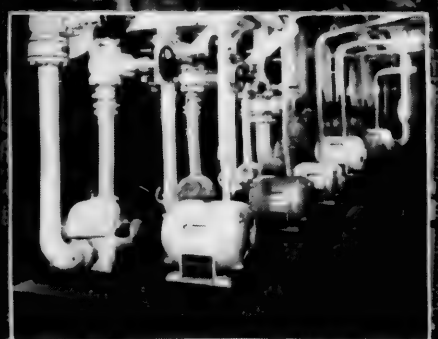
Two 350-hp Elliott C-W motors driving refrigeration compressors at a New York building.

to the city...



Squirrel-cage dripproof motor for general purpose use. Available in wide modifications to meet a variety of conditions.

ELLIOTT
CROCKER-WHEELER
MOTORS



Three 60-hp and four 150-hp Elliott C-W motors driving pumps in an attractive New York hotel.

Photo from Fairchild Aerial Surveys, Inc.

●Backed by over sixty years of proven design and construction, these rugged motors are favored for the big air conditioning jobs in city after city throughout the country. In New York City, for example, Elliott C-W motors are serving modern buildings such as: The Waldorf-Astoria, Lever House, Dun & Bradstreet, U.S. Steel and The United Nations, to name just a few.

In addition to air-conditioning drives, reliable Elliott motors are used in large numbers for driving fire pumps, sump pumps, fans, sewage ejector pumps, and other auxiliary service equipment. For detailed information call your local Elliott representative, or write Elliott Company, Crocker-Wheeler Division, Jeannette, Pa.

ELLIOTT Company

STEAM TURBINES • MOTORS • GENERATORS • DEAERATING HEATERS • EJECTORS
CONDENSERS • CENTRIFUGAL COMPRESSORS • TURBOCHARGERS • TUBE CLEANERS • STRAINERS

WS-10

Carrier again makes news

▲ *Carrier Weathermakers without ductwork cool supermarket*

▼ *Carrier High-Velocity System is ideal for "interior zones."*

▲ *Carrier Zoning Weathermaker keeps comfort constant. Air-Cooled Weathermakers serve smaller stores.* ▼

Here are the best ways to air condition a supermarket, a shopping center, a department store

The odds are high that air conditioning will be a factor in any supermarket, shopping center or department store you're commissioned to do.

Your job: select the type of air conditioning that will best fit your plan and the client's requirements.

Here's where knowing the breadth of the Carrier line can save time for you and money for your clients. Carrier has *all* the ways to air condition *any* job. A few examples . . .

New Carrier Weathermaker* (top left). It's the self-contained air conditioner designed for lower installation costs. For small supermarkets, it gives the equivalent of a customized, built-in system—at lower cost. Exclusive design features give the new Weathermaker extreme flexibility of application.

Carrier High-Velocity System (bottom left). Developed by Carrier primarily for the "interior zone" of stores and buildings. It features small cross-section ducts and conduits, all-around compactness, ease of installation, simplified maintenance, quietness, and great flexibility.

Carrier Zoning Weathermaker (top right). You can plan "departmentalized" air conditioning which gives each area of the store or building the climate it orders. Carrier Zoning Weathermakers will keep comfort constant in as many as 14 different zones, regardless of differences or changes in heat loads.

Carrier Air-Cooled Weathermaker (bottom right). It air conditions without water. Location of unit is not dependent on water supply. Fewer connections mean simplified installation. Maintenance costs are appreciably lower than for water-cooled models that require water-saving devices.

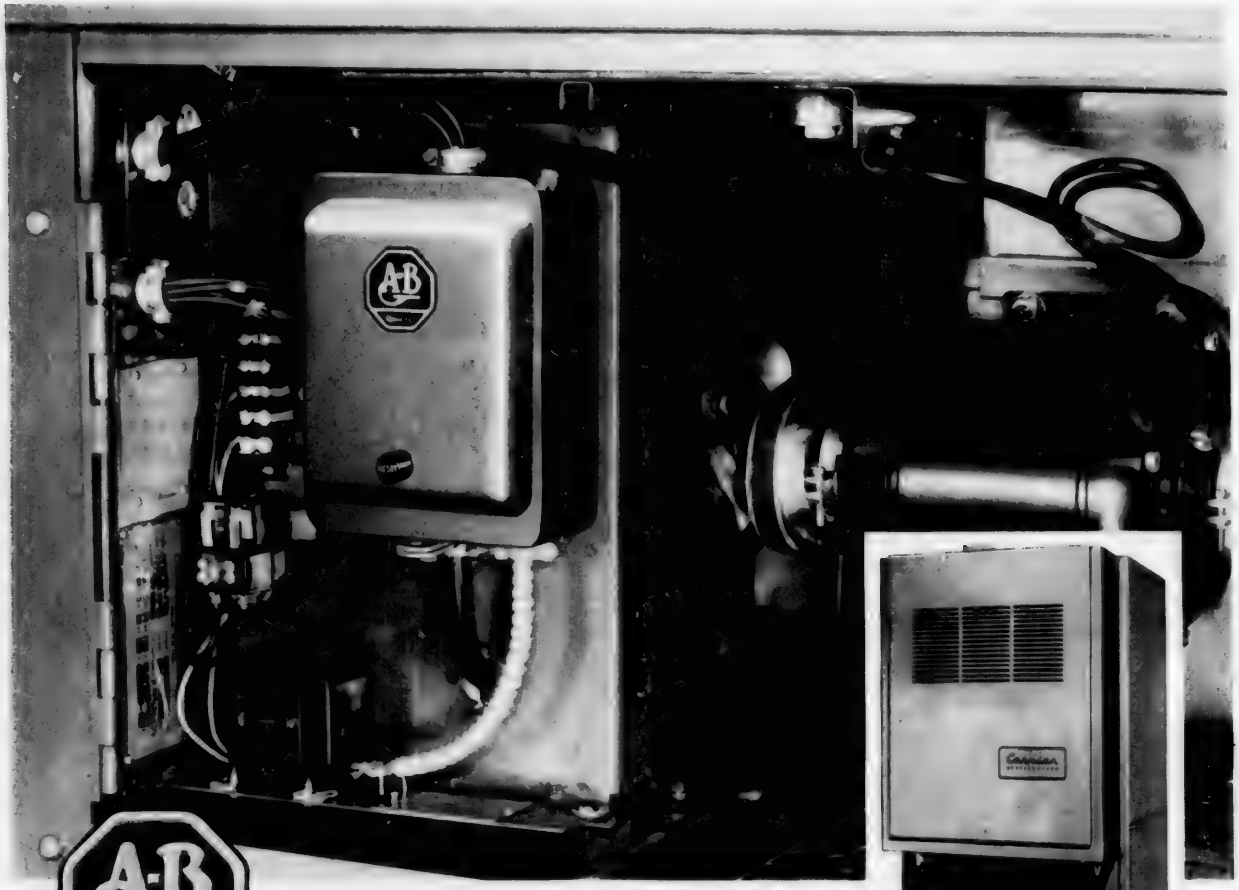
All Carrier equipment is engineered to the same high standard of quality. This means you can short-cut hours of selection by (1) using the Carrier line as your shopping guide and then (2) comparing values. Get in touch with your Carrier dealer or distributor—listed in the Classified Telephone Directory. Or write directly to us: Carrier Corporation, Syracuse, New York. *Reg. U.S. Pat. Off.

Carrier

air conditioning • refrigeration • industrial heating

Carrier *Weathermaker Air-Conditioning Units*

operated by ALLEN-BRADLEY TROUBLE FREE MOTOR CONTROLS

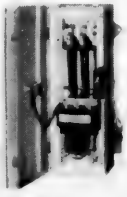


The Sign of Quality Motor Control

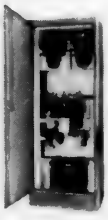
Carrier Weathermaker No. 38C air conditioner for residential use

Typical Allen-Bradley Quality Motor Controls

Bulletin 736 Part Winding Motor Starter



Bulletin 640 Manual Resistance Type Starter



Bulletin 746 Automatic Auto-transformer Type Starter

To obtain reliable service year after year, from an air-conditioning or refrigeration unit, it must be equipped with a starter built to "take it". . . and over the last 25 years Allen-Bradley Bulletin 709 solenoid starters have established their reputation for dependable operation.

This performance is due to the simplest starter mechanism yet conceived . . . the solenoid switch with only ONE moving part. No pins, pivots, or bearings to corrode and bind . . . no jumpers to break. The cadmium silver alloy contacts never require troublesome cleaning, filing, or dressing.

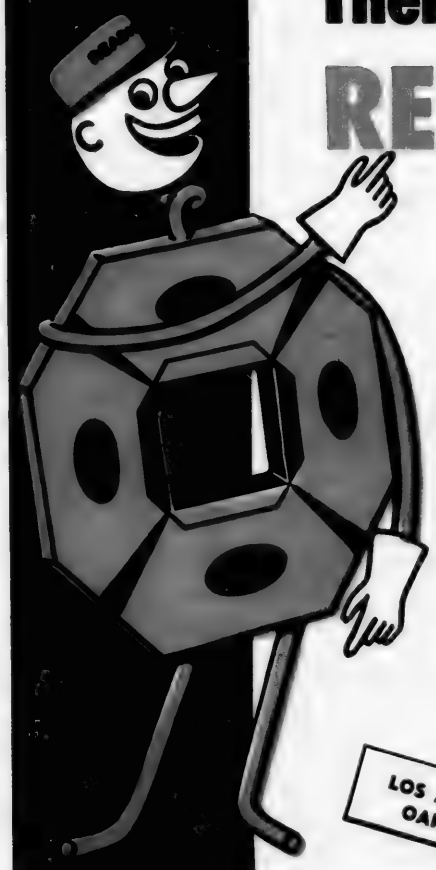
In addition, Allen-Bradley Quality Motor Controls have these "plus" values . . . overload relays that retain their accuracy irrespective of time or operating conditions . . . highly efficient magnetic circuits that hold through wide voltage fluctuations . . . white interiors that make for easier wiring in dark locations. Specify Allen-Bradley . . . for millions of trouble free operations.

Complete information on Allen-Bradley Quality controls is contained in the A-B Handy Catalog . . . an abbreviated encyclopedia on motor control. Write for your copy, today.

Allen-Bradley Co.
1330 S. Second St., Milwaukee 4, Wis.
In Canada
Allen-Bradley Canada Ltd., Galt, Ont.

ALLEN-BRADLEY
SOLENOID MOTOR CONTROL
QUALITY

Mr. JOBBER...



There's a

READING TUBE DEPOT near you

to assure fast dependable service on the Copper Tube you can recommend with confidence!

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HOUSTON, TEXAS
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DENVER, COLO.
2845 Walnut St.

CLEVELAND, OHIO
4615 Perkins Ave.

CHICAGO, ILL.
724 W. 50th St.

LOS ANGELES, CALIF.
OAKLAND, CALIF.

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Sold Through Wholesalers Only

It's good business to know that wherever your warehouse, you're within easy reach of a Reading Tube depot. You can always be sure of the right amount of tubing at the right time to meet even the most urgent orders.

And you can be sure that you're building good will, as well as your business, with every order . . . because you treat your customers to a bonus of *extra quality* every time you deliver Reading Copper Tube. We make tubing and only tubing, in one of America's most modern, completely integrated mills. By specializing, we can deliver a better product to you . . . a product you will be proud to deliver, too.

READING TUBE CORPORATION

EMPIRE STATE BUILDING, NEW YORK 1, N. Y.

WORKS: READING, PA.

Prudential's regional office building at Jacksonville is one of the largest structures in the Southeast. *Mechanical Contractors:* Henley & Beckwith, Inc. *Jobber:* Hajoca Corporation.

New Prudential Building in Florida Has Beth-Co-Weld Piping

This handsome structure, completed recently at Jacksonville, Fla., is one of the new regional office buildings of The Prudential Insurance Company of America. Standing on the banks of the St. Johns River, the 22-story building is one of the largest in the Southeast. Beneath its facade of marble, limestone and pink granite lies a complex network of general-purpose piping, nearly all of which is made up of Beth-Co-Weld steel pipe.

Beth-Co-Weld is good, sound pipe. It is manufactured by the continuous-weld process. It is uniform in quality, and easy to work.

Beth-Co-Weld is produced in sizes ranging from ½ in. to 4 in. in standard weight, and from ½ in. to 3 in. in extra-strong weight. It is furnished in uniform 21-ft lengths, plus or minus 1 in., as well as in random lengths.

You will like the dependability of Beth-Co-Weld. Why not order a supply today from your jobber!

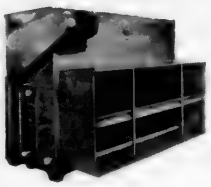
BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

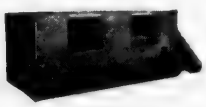
On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL

There's no "*or Equal*" when you select... BUSH



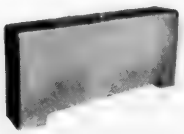


'AH' AIR HANDLING UNITS

Available in 12 models from 800 CFM to 28,800 CFM. Floor-standing vertical and ceiling-hung horizontal models with direct expansion, water or steam coils. Face and by-pass damper sections, mixing boxes, spray type humidifiers and filter sections available for all units. Models AH-10 to AH-32 available with *Inner-Fin* coils.

'MZ' MULTIZONE UNITS

Available in 9 sizes covering a range from 2,560 CFM to 28,800 CFM, Multizone Units parallel the standard Bush HAH Air Handling units, using the same proven blower sections and accessories such as filter sections and mixing boxes. Zone dividers may be arranged as desired — vertical, horizontal or a combination of both. Entire interior is well insulated and undercoated. Units can be shipped sectionally when this is desired to facilitate installation.

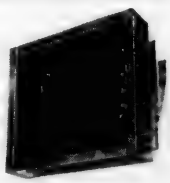


'CR' REMOTE AIR CONDITIONING UNITS

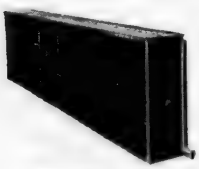
Provide quiet, economical year 'round air conditioning for all types of multi-room buildings. Units are available in vertical floor and horizontal ceiling models . . . feature individual room control . . . are easily incorporated in new or existing buildings.

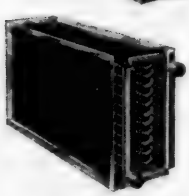
The BUSH line of air conditioning equipment includes units of all types to meet your every requirement. For single-source simplicity, select quality-constructed, advanced design BUSH units. And for capable engineering or specifying assistance, contact your BUSH sales engineer.

'IDX' INNER-FIN AIR CONDITIONING COILS



Available in standard stock sizes 2, 3, 5 and 7½ tons for simplified selection. Inner-Fin construction permits use of smaller size coil for any desired capacity. Shallower depth requires less fan horsepower. Coils completely flanged for easy installation.

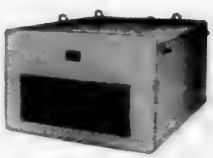




DX WATER AND STEAM COILS

Bush Water, Steam and DX Coils are supplied in standardized and matched sizes. Singly or in combination, can be arranged to fit practically any installation. Constructed of collar spaced serrated aluminum fins bonded to copper tube, staggered in direction of air flow.

'CC' COMFORT CONDITIONERS



Engineered and constructed for use in the conditioned area. Motors mounted inside casings. Attractive insulated cases, noiseless operation. Available with direct expansion coils of Inner-Fin construction. Where steam coils are desired, inner tubes of DX coil are specially circuited. Water cooling or heating coils also available.

Request Catalogs containing complete specifications on units shown.

BUSH MANUFACTURING CO.

these 7 Keys open every door to

Water cooling has no "closed doors" this year. No matter what the problem, one of these 7 Marley cooling towers is the key. Special problems, such as tower location, fire codes, unusual corrosive conditions — all can easily be met and mastered with one of these '56 Marley cooling towers.

Marley towers cover the water cooling front — meet every service condition and capacity requirement. They're available when and where you need them, for stocks are maintained in all sizable cities. Call your reliable Marley distributor for information on the world's most complete line of water cooling towers for air conditioning and refrigeration.

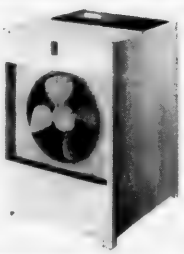
* MarClad Finish is standard on all '56 steel Aquatowers. This high-temperature, thermo-setting plastic defies the corrosive effects of acids, alkalies, water — insures a longer and happier service life than any other packaged cooling tower!

AQUATOWERS® (large capacity)

Models 4220 through 4250 provide the full performance water cooling ability and long service life essential to commercial refrigeration and air conditioning application. Fabricated of heavy gauge steel, ruggedness and durability are apparent in the construction of these towers. Their design incorporates a new ease of assembly and disassembly whenever required. These features plus operating and maintenance simplicity make them the first choice of discriminating buyers.

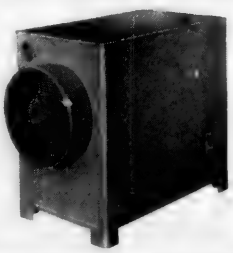
AQUATOWERS® (medium capacity)

Models 4105 through 4115 run the gamut of intermediate capacity applications. These completely welded, heavy gauge steel units come fully assembled for easy field application. Highlight features include MarClad* finish . . . readily removable open distribution basin . . . quiet, deep pitched fan . . . Marley lifetime nailless filling. Like other Aquatowers, they can be located indoors or out.

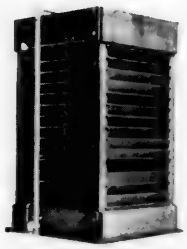


AQUATOWERS® (small capacity)

Models 4102 and 4103 are designed for 2 to 4 tons of refrigeration or air conditioning. Installation, operation and maintenance are extremely simple, yet these small models incorporate the high-performance design features of larger Aquatowers. MarClad* finish lends that adaptability and compatibility that is so appealing to owners.

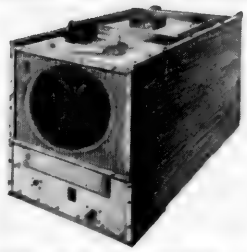


Successful Water Cooling



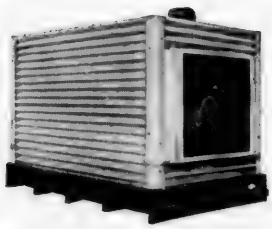
SPRATOWERS® (Natural Draft)

There is nothing like a Marley Spratower for water cooling installations where minimum initial investment and lowest operating costs are essential. '56 Marley Spratowers incorporate a new super-spray system that achieves maximum water break-up and air-water contact. They are fabricated of select heart quality California redwood and shipped disassembled. Available in 11 air conditioning and refrigeration sizes.



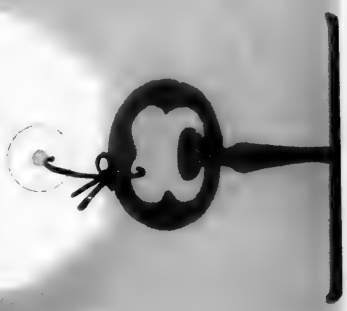
WOOD AQUATOWERS® (small)

Structural durability is outstanding in these all-wood towers produced in 5 models for service requirements of 3 through 15 tons. Ships factory-assembled for easy installation. Designed specifically for localities with high corrosion incidence, the forced draft design permits location of mechanical equipment out of the hot, humid air stream.



WOOD AQUATOWERS® (large)

These all-redwood towers with heavy asbestos cement board casing are designed for longest service life under most corrosive operating conditions. Applicable to all services from 20 to 50 tons, they make use of forced-draft and cross-flow principles. Air discharge is vertical, making this tower applicable to many restricted locations. Ships disassembled; easily hoisted and erected.



AQUACOOLERS®

This induced draft-counterflow tower was designed primarily for indoor installation, but is equally adaptable to outdoor service. Available in 5 sizes with capacities from 3 to 15 tons, the Aquacooler uses both pressure spray and MarPak® nailless filling to achieve maximum water break-up, longer air-water contact, higher performance.

"Nothing cools as well as water . . . nothing cools water as well as a Marley cooling tower"

MARLEY®

The Marley Company

Kansas City, Missouri

Random Thoughts from a Filter Engineer

by William B. Watterson
SALES ENGINEERING DEPT.

- **OUR COMPETITORS MAKE GOOD AIR FILTERS**
- **WHY NOT SEALED BIDS?**
- **"DE-HUMBUGGING" THE ADS**

OUR COMPETITORS MAKE GOOD AIR FILTERS

It may seem unusual to tip our hat to competitors, especially in print. But honesty compels us to state that when you buy air filters from *any* reliable manufacturer you buy a product that well serves its intended purpose.

There are few, if any, secrets left in the air filter business. The accepted principles of removing air-borne dirt by straining, impinging, centrifuging or precipitation have been known before the turn of the century.

Perhaps the most important factor in buying filters is to select the right type for the job. That's where a manufacturer with long experience and a wide range of filter *types* can offer you something extra. When you bring your air filtration problem to him, the odds are more in your favor that the solution will be correct.

Air-Maze is one of the places where such a combination exists—more than 30 years experience in making almost every known type of air filter. We invite your consideration.

WHY NOT SEALED BIDS?

We see where a sub-contractor recently sued the general contractor because he used the sub-contractor's bid to get the job, then started to shop around for a better price. The court upheld the plaintiff and awarded him the profit he would have made, compensating for his work in preparing his estimate.

Preparing specifications on a job costs money and time. No one objects if the job is finally awarded at a fair price. But often, the contractor "shops around" and the eventual winner finds only a shallow victory in the form of a no-profit price.

We believe in competitive bidding. It's the American way and it generally results in lower costs. But how about limiting it to just one bid per competitor—a sealed bid? Can't the "going in and coming out price" and the resultant auction be eliminated?

"DE-HUMBUGGING" THE ADS

Some of our contemporaries are claiming strange virtues for all-metal filter panels. One says "no oil is required at all". And another puts it this way, "heavy, messy oils are prohibited".

It's true that any metal filter (even those we make) can be operated dry, or nearly so. The trouble is, they're not very efficient that way, particularly for fine dust. And what little is stopped temporarily, generally manages to dislodge and pass through the filter. Only after enough lint or bulky particles are collected on the face, do such filters do much filtering.

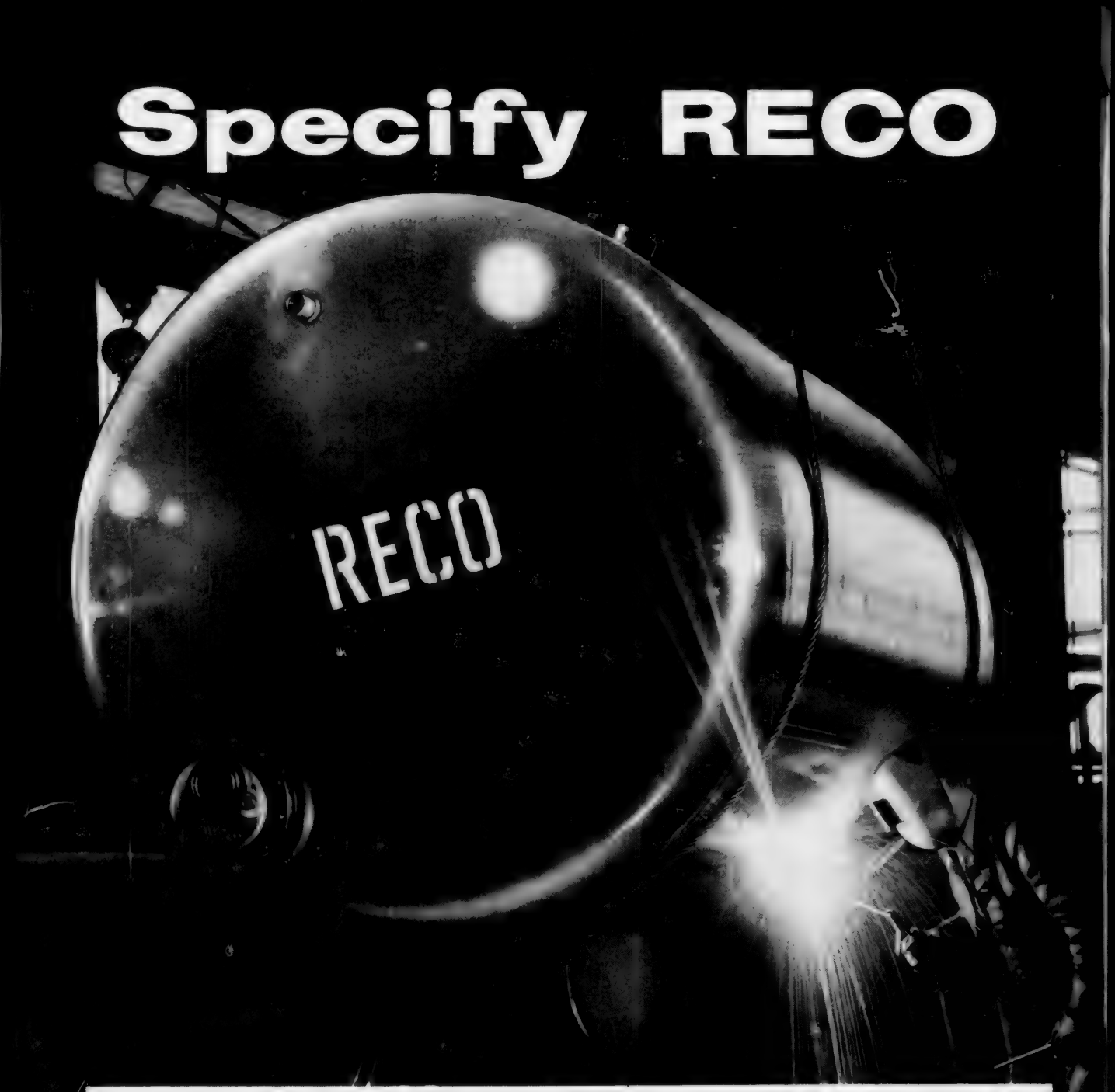
Let's face it. The viscous impingement filter *does* require servicing, but in return it holds more dirt than any other kind. If you duck the service problem by using the filter dry or almost dry, you defeat the very thing for which the filter was designed—that of stopping dirt.

If you really want a dry filter, there are several good ones on the market—including one we make—that use a truly strainer-type media. The Air-Maze Corporation, 25000 Miles Road, Cleveland 28, Ohio.

AFI MEMBER AIR FILTER INSTITUTE

AIR-MAZE
The Filter Engineers
AIR FILTERS • SILENCERS • SPARK ARRESTERS
LIQUID FILTERS • OIL SEPARATORS • GREASE FILTERS

Specify RECO



RECO HOT WATER STORAGE HEATERS MET GOVERNMENT SPECIFICATIONS FOR QUALITY for Bldg. No. 10, National Institutes of Health. RECO backed up their quality with the right price and guaranteed delivery on schedule. For years of trouble-free hot water service, specify RECO HOT WATER STORAGE HEATERS.

Building 10, National Institutes of Health, Bethesda, Md.
Designed by – Public Buildings Service, Wash., D.C.
Mechanical Contractor Standard Engr. Co., Wash., D.C.

RECOgnized for superior quality in 48 states and 16 foreign countries.

RECOmmended by leading engineers, contractors and architects.

RECO Hot Water Storage Heaters, Convertors and Instantaneous Heaters.

For free catalogs and the name of the RECO Representative nearest you, write:
Richmond Engineering Co., Inc., Dept. A, 7th & Hospital Streets, Richmond 5, Va.—Phone 7-2611

Richmond Engineering CO., Inc.

Chase® Type L Copper Tube!

It's a sure thing! Your heating, air conditioning and refrigeration equipment will deliver dependable, *peak performance over the years,* when you fabricate with Chase Type L copper tube!

Inside and outside diameters accurate to thousandths of an inch assure proper tolerances for fitting connections. That means extra-easy assembly of finned sections. Smooth interiors of tube and Chase solder-joint fittings insure a steady, even flow of heating or cooling liquids. And for extra cleanliness, you can get Chase Type L copper tube tightly capped at slight extra cost.

Order Chase Type L copper tube, Chase extra-soft copper refrigeration tube and Chase wrought copper solder-joint fittings from the Chase wholesaler near you!

Chase®

BRASS & COPPER CO.

WATERBURY 20, CONNECTICUT • SUBSIDIARY OF KENNECOTT COPPER CORPORATION

The Nation's Headquarters for Brass & Copper

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Los Angeles • Milwaukee • Minneapolis • Newark • New Orleans • New York • Philadelphia • Pittsburgh • Providence • Rochester • St. Louis • San Francisco • Seattle • Waterbury

DIMENSIONAL AND CAPACITY DATA — TYPE K COPPER TUBE

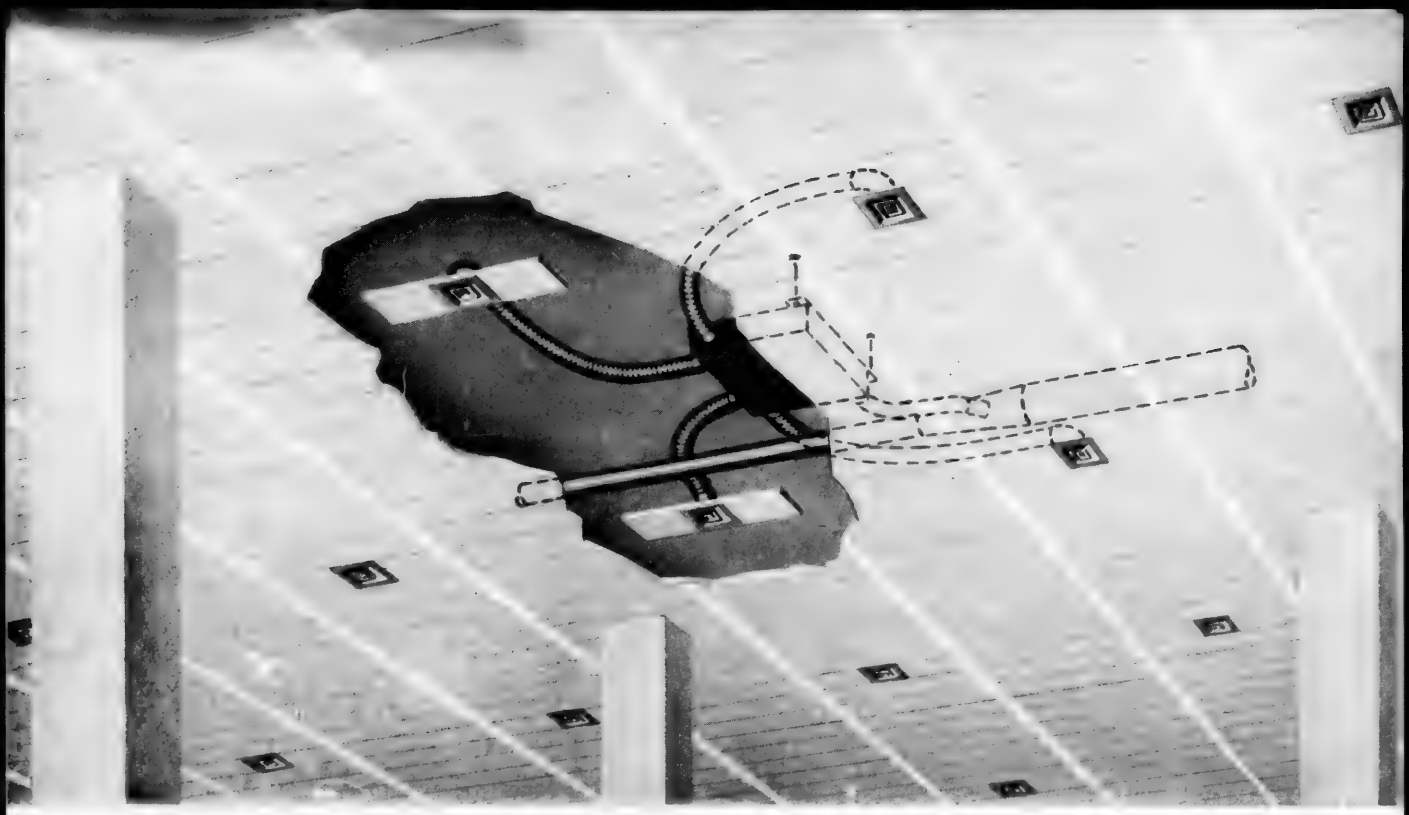
Diameter, Inches			Wall Thickness, In.	Cross-Sectional Area, Sq. In.			Weight per Foot, Lb.		
Nominal	Actual Inside	Actual Outside		Outside	Inside	Metal	Of Tube Alone	Of Water in Tube	Of Tube and Water
¼	0.311	0.375	0.032	0.110	0.076	0.034	0.134	0.033	0.167
⅜	0.402	0.500	0.049	0.196	0.127	0.069	0.269	0.055	0.324
½	0.527	0.625	0.049	0.307	0.218	0.089	0.344	0.094	0.438
⅝	0.652	0.750	0.049	0.442	0.334	0.108	0.418	0.145	0.563
¾	0.745	0.875	0.065	0.601	0.436	0.165	0.641	0.189	0.830
1	0.995	1.125	0.065	0.993	0.777	0.216	0.839	0.338	1.177
1¼	1.245	1.375	0.065	1.484	1.217	0.267	1.04	0.53	1.57
1½	1.481	1.625	0.072	2.072	1.722	0.350	1.36	1.22	2.58
2	1.959	2.125	0.083	3.546	3.013	0.533	2.06	1.31	3.37
2½	2.435	2.625	0.095	5.409	4.654	0.755	2.93	2.02	4.95
3	2.907	3.125	0.109	7.669	6.634	1.035	4.00	2.88	6.88
3½	3.385	3.625	0.120	10.321	8.999	1.322	5.12	3.91	9.03
4	3.857	4.125	0.134	13.361	11.682	1.679	6.51	5.07	11.58
5	4.805	5.125	0.160	20.626	18.126	2.500	9.67	7.87	17.54
6	5.741	6.125	0.192	29.453	25.874	3.579	13.9	11.2	25.1
8	7.583	8.125	0.271	51.826	45.138	6.888	25.9	19.6	45.5
10	9.449	10.125	0.338	80.463	70.085	10.378	40.3	30.4	70.7
12	11.315	12.125	0.405	115.395	100.480	14.915	57.8	43.6	101.4

Nominal Dia., In.	Circumference, Inches		Sq. Ft. of Surface per Lineal Foot		Contents of Tube per Lineal Foot		Lineal Feet to Contain		
	Outside	Inside	Outside	Inside	Cu. Ft.	Gal.	1 Cu. Ft.	1 Gal.	1 Lb. of Water
¼	1.178	0.977	0.098	0.081	.00052	.00389	1923	257	30.8
⅜	1.570	1.262	0.131	0.105	.00088	.00658	1136	152	18.2
½	1.963	1.655	0.164	0.138	.00151	.01129	662	88.6	10.6
⅝	2.355	2.047	0.196	0.171	.00232	.01735	431	57.6	6.90
¾	2.748	2.339	0.229	0.195	.00303	.02664	330	37.5	5.28
1	3.533	3.124	0.294	0.260	.00540	.04039	185	24.8	2.96
1¼	4.318	3.909	0.360	0.326	.00845	.06321	118	15.8	1.89
1½	5.103	4.650	0.425	0.388	.01958	.14646	51.1	6.83	0.817
2	6.673	6.151	0.556	0.513	.02092	.15648	47.8	6.39	0.765
2½	8.243	7.646	0.688	0.637	.03232	.24175	30.9	4.14	0.495
3	9.813	9.128	0.818	0.761	.04607	.34460	21.7	2.90	0.347
3½	11.388	10.634	0.949	0.886	.06249	.46745	15.8	2.14	0.257
4	12.953	12.111	1.080	1.009	.08113	.60682	12.3	1.65	0.197
5	16.093	15.088	1.341	1.257	.12587	.94151	7.94	1.06	0.127
6	19.233	18.027	1.603	1.502	.17968	1.3440	5.56	0.744	0.089
8	25.513	23.811	2.126	1.984	.31345	2.3446	3.19	0.426	0.051
10	31.793	29.670	2.649	2.473	.48670	3.4405	2.05	0.291	0.033
12	38.073	35.529	3.173	2.961	.69778	5.2194	1.43	0.192	0.023

DIMENSIONAL AND CAPACITY DATA — TYPE L COPPER TUBE

Diameter, Inches			Wall Thickness, In.	Cross-Sectional Area, Sq. In.			Weight per Foot, Lb.		
Nominal	Actual Inside	Actual Outside		Outside	Inside	Metal	Of Tube Alone	Of Water in Tube	Of Tube and Water
¼	0.315	0.375	0.030	0.110	0.078	0.032	0.126	0.034	0.160
⅜	0.430	0.500	0.035	0.196	0.145	0.051	0.198	0.063	0.261
½	0.545	0.625	0.040	0.307	0.233	0.074	0.285	0.101	0.386
⅝	0.666	0.750	0.042	0.442	0.348	0.094	0.362	0.151	0.513
¾	0.785	0.875	0.045	0.601	0.484	0.117	0.455	0.210	0.565
1	1.025	1.125	0.050	0.993	0.825	0.168	0.655	0.358	1.013
1¼	1.265	1.375	0.055	1.484	1.256	0.228	0.884	0.545	1.429
1½	1.505	1.625	0.060	2.072	1.778	0.294	1.14	0.77	1.91
2	1.985	2.125	0.070	3.546	3.093	0.453	1.75	1.34	3.09
2½	2.465	2.625	0.080	5.409	4.770	0.639	2.48	2.07	4.55
3	2.945	3.125	0.090	7.669	6.808	0.861	3.33	2.96	6.29
3½	3.425	3.625	0.100	10.321	9.214	1.107	4.29	4.00	8.29
4	3.905	4.125	0.110	13.361	11.971	1.390	5.38	5.20	10.58
5	4.875	5.125	0.125	20.626	18.659	1.967	7.61	8.10	15.71
6	5.845	6.125	0.140	29.453	26.817	2.636	10.2	11.6	21.8
8	7.725	8.125	0.200	51.826	46.849	4.977	19.3	20.3	39.6
10	9.625	10.125	0.250	80.463	72.722	7.741	30.1	31.6	61.7
12	11.565	12.125	0.280	115.395	104.994	10.401	40.4	45.6	86.0

Nominal Dia., In.	Circumference, Inches		Sq. Ft. of Surface per Lineal Foot		Contents of Tube per Lineal Foot		Lineal Feet to Contain		
	Outside	Inside	Outside	Inside	Cu. Ft.	Gal.	1 Cu. Ft.	1 Gal.	1 Lb. of Water
¼	1.178	0.989	0.098	0.082	.00054	.0040	1852	250	29.6
⅜	1.570	1.350	0.131	0.113	.00100	.0075	1000	133	16.0
½	1.963	1.711	0.164	0.143	.00162	.0121	617.3	82.6	9.87
⅝	2.355	2.091	0.196	0.174	.00242	.0181	413.2	55.2	6.61
¾	2.748	2.465	0.229	0.205	.00336	.0251	297.6	40.5	4.76
1	3.533	3.219	0.294	0.268	.00573	.0429	174.5	23.3	2.79
1¼	4.318	3.972	0.360	0.331	.00872	.0652	114.7	15.3	1.83
1½	5.103	4.726	0.425	0.394	.01237	.0925	80.84	10.8	1.29
2	6.673	6.233	0.556	0.519	.02147	.1606	46.58	6.23	0.745
2½	8.243	7.740	0.688	0.645	.03312	.2478	30.19	4.04	0.483
3	9.813	9.247	0.818	0.771	.04728	.3537	21.15	2.83	0.338
3½	11.388	10.760	0.949	0.897	.06398	.4786	15.63	2.09	0.251
4	12.953	12.262	1.080	1.022	.08313	.6218	12.03	1.61	0.192
5	16.093	15.308	1.341	1.276	.12958	.9693	7.720	1.03	0.123
6	19.233	18.353	1.603	1.529	.18622	1.393	5.371	0.718	0.0592
8	25.513	24.465	2.126	2.039	.32534	2.434	3.074	0.411	0.0492
10	31.793	30.223	2.649	2.519	.50501	3.777	1.980	0.265	0.0317
12	38.073	36.314	3.173	3.026	.72912	5.454	1.372	0.183	0.0219

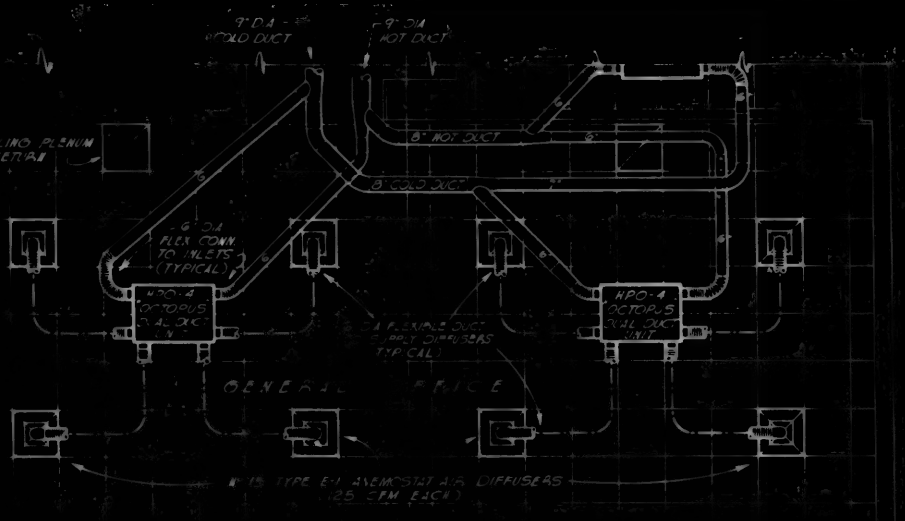


Here's *flexible* high velocity air diffusion

Here's how the new Anemostat Octopus unit works in interior zone air conditioning. High velocity air travels to a sound attenuator volume control unit, which has from *two* to *four* openings. The air is carried from these outlets through flexible hose to Anemostat diffusers. These have the same outer dimensions as the acoustical panels. If the space must be adjusted to meet changing conditions, such as subdivision of the occupied area, ceiling panels and diffusers can be quickly relocated by merely moving the flexible hose.

Air can be supplied to the Anemostat Octopus sound attenuators from a dual-duct system with a thermostat controlling one bay, or from a single-duct system with automatic or manual control.

Write on your business letterhead for Selection Manual 50 which gives full application and specification data on wide range line of Anemostat All-Air High Velocity units. Anemostat Corporation of America, 10 East 39th Street, New York 16, N. Y.


9" DIA COLD DUCT
9" DIA HOT DUCT
CEILING PLENUM RETURN
8" HOT DUCT
8" COLD DUCT
6" DIA FLEX CONN TO INLETS (TYPICAL)
HPO-4 OCTOPUS DUAL DUCT UNIT
HPO-4 OCTOPUS DUAL DUCT UNIT
FLEXIBLE DUCT TO DIFFUSERS TYP. CAL.
GENERAL OFFICE
TYPE E-1 ANEMOSTAT AIR DIFFUSERS (125 CFM EACH)

Diagrammatic illustration of office building showing Anemostat HPO-4 Dual-duct Units

IS YOUR REPUTATION AT STAKE ON THIS JOB?

Make-shift or hit and miss piping systems are not only costly in corrections and repairs . . . but certainly reflect on the ability of the mechanical engineer. It is *not* necessary to gamble on an efficient, long lasting insulated piping system. RIC-WIL's forty-five years in the Insulated Piping Field is your assurance of the finest piping system for both overhead and underground use. Specify RIC-WIL and be sure of the results. For complete technical information contact your nearest RIC-WIL field representative or send for the RIC-WIL catalog.

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. . . of Exceptionally High Thermal Efficiency

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PREFABRICATED INSULATED PIPING SYSTEMS
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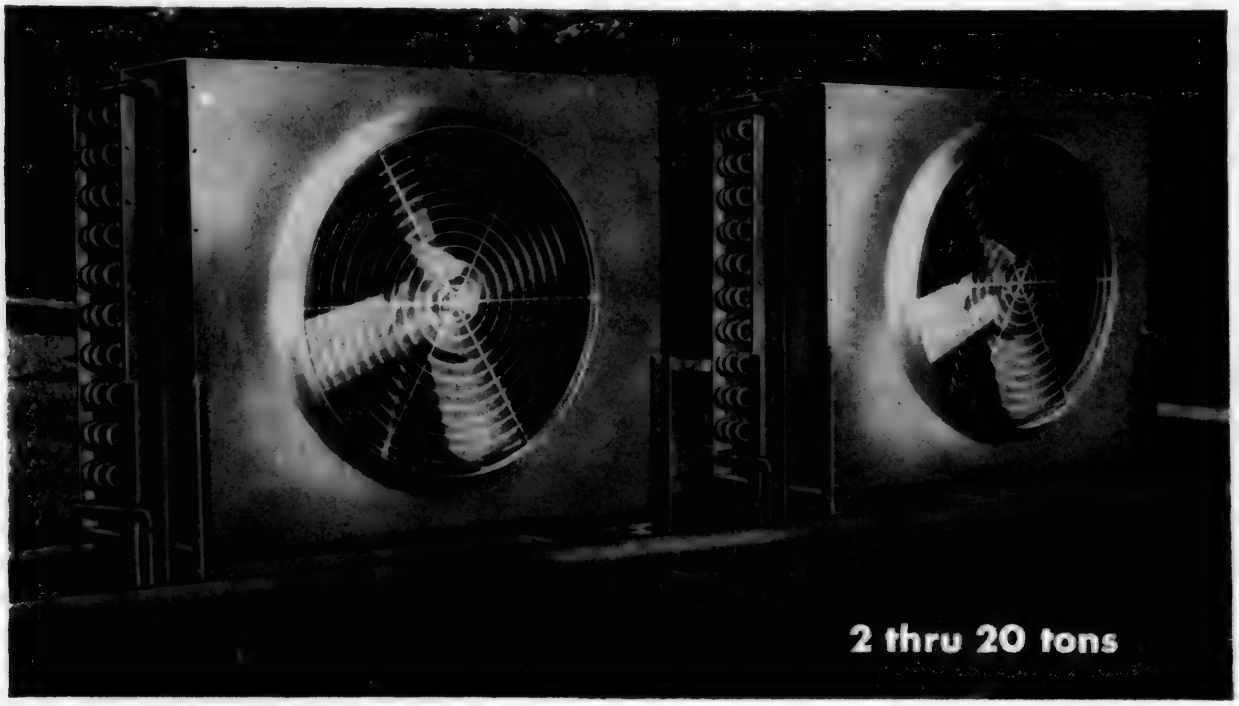
"LET'S GIVE THIS INDUSTRY A BETTER AIR-COOLED CONDENSER"



Now we proudly call to your attention the Halstead & Mitchell Air-Cooled Condenser for waterless air conditioning and refrigeration. This is today's *better* remote Air-Cooled Condenser.

It is engineered to a new principle called "Co-ordinated Design," and this is engineering pioneering which has coordinated capacity, performance, structural design and appearance to give:

1. Extra-Safe Capacity Ratings — made possible by a unique "dimpled" fin *giving 15% added heat transfer,* as well as a core designed for higher air volumes at lower fan speed.

2. Extra Years of Working Life — insured by exclusive, proven Halstead & Mitchell protection against corrosion; lifetime ball bearings; and a tubing assembly pattern which is self-reinforcing and thus deadens vibration before it starts.

3. Extra-Quiet Operation—which is the direct result of deep-pitch fan blades driven at slow speeds.

4. Extra-Easy Multi-Circuiting—developed for Halstead & Mitchell remote Air-Cooled Condensers by engineers who know what simpler manifolding and selection of circuits can mean when several air conditioning and refrigeration machines must work off a single coil.

Even more important, you know these Air-Cooled Condensers bring you—with their Halstead & Mitchell nameplate—an assurance of the highest quality in the industry. Whether you are jobber, contractor, architect or manufacturer (and we'll be pleased to give quantity quotations), order Halstead & Mitchell "Co-ordinated Design" for *the better Air-Cooled Condenser.*

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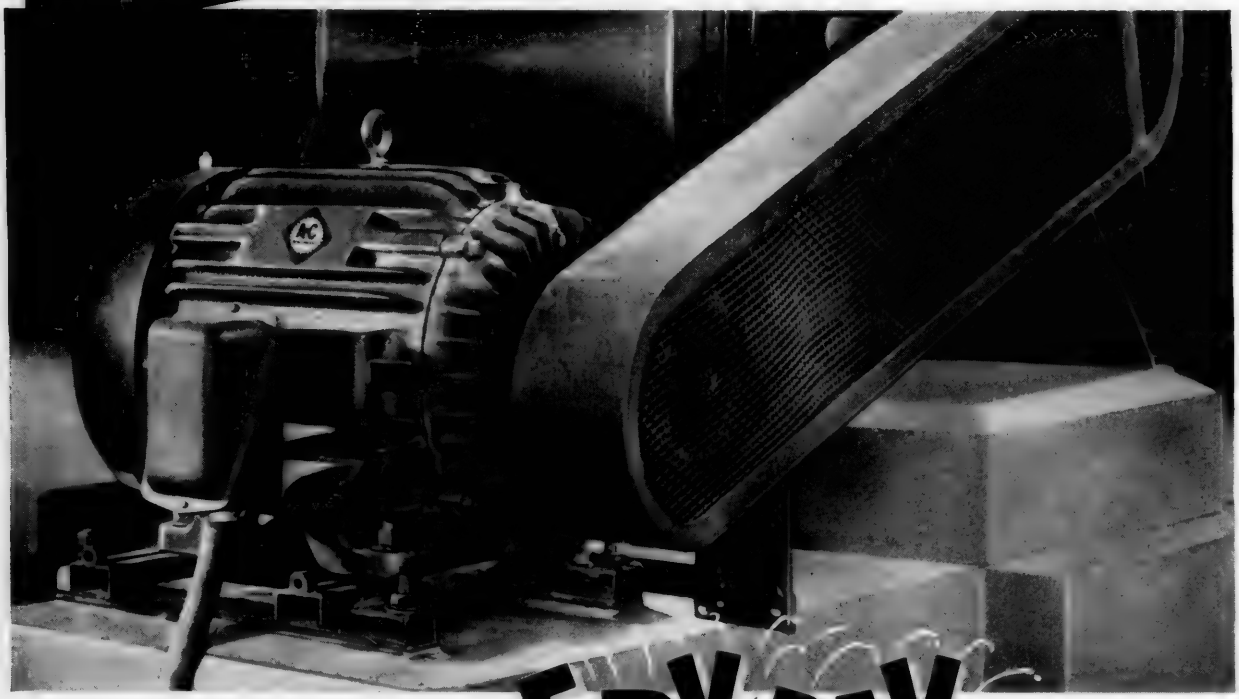

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A complete cooling unit for homes, apartments, commercial and industrial buildings, process work. Design highlights include low pressure drop through evaporator—non-recycling pump-down—integrated electrical control system—low center of gravity for easy installation. Completely wired, including chiller and tower pump. Send for Bulletin HB-735.

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B&G Evaporators, Condensers and other heat exchange equipment offer time-tested design—rugged construction—precision workmanship—all combined to provide top performance and long life. These units are built to ASME Code requirements.

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FOR IMMEDIATE SHIPMENT

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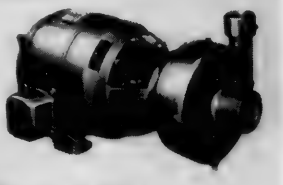
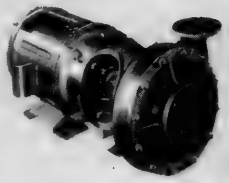


★ **B&G Series 1522 Pumps**



★ **B&G Series 1531 Pumps**

★ **B&G Model CRF Straight Tube Condensers**

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Engineering is the backbone of Peerless progress. With our new facilities, it will push our standards to an even higher level. Whether your installation problem is routine or complex, we'll work with you to solve it most efficiently.

The best way to start any air moving job is to consult the Peerless Fan and Blower Bulletins. SDA-160 gives complete data on fans and forward curve blowers. SDA-200 completely catalogs Peerless backward curve blowers. Put them in your file today. If you don't have them, write to us. We'll send them by return mail.

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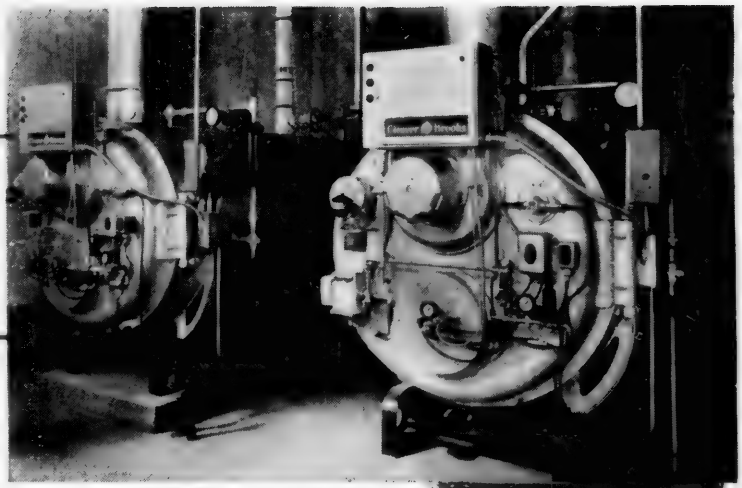
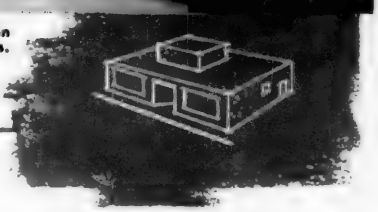
18 sizes
110 models
15 to 600 hp

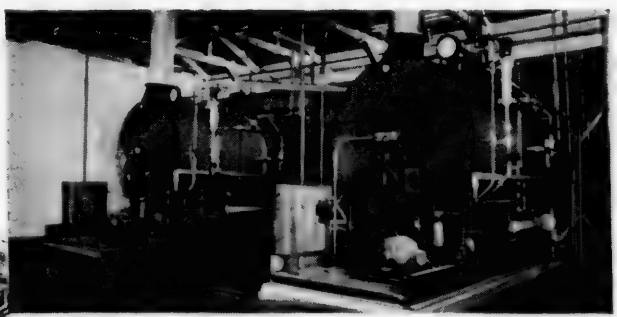
yours from Cleaver-Brooks



CB SERIES — The ultimate in compact, quiet-running boilers. Sizes: 15 to 150 hp.



the broadest line of cost-saving "packaged" boilers—for hundreds of applications



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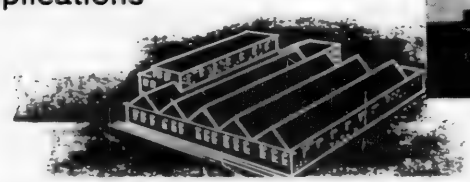

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TWENTY-FIVE YEARS OF LEADERSHIP
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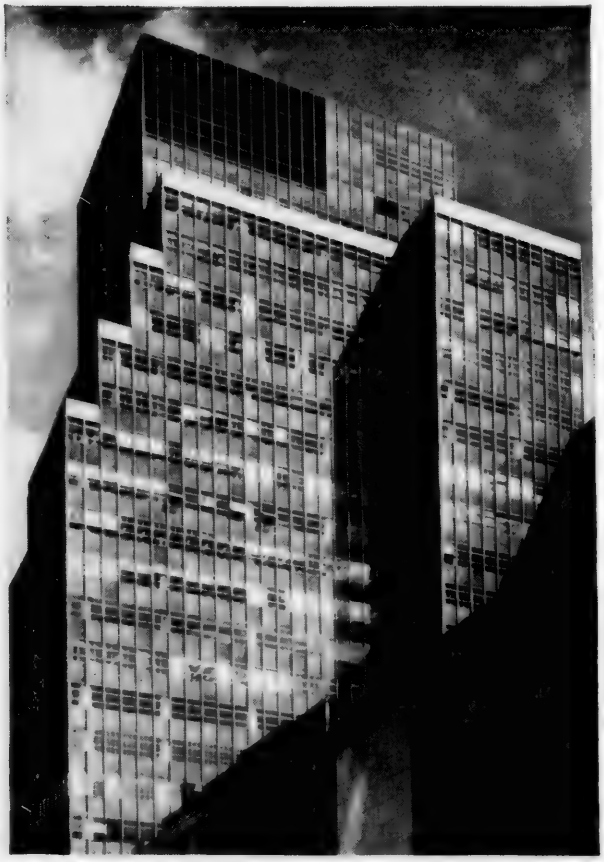
MILE HIGH: 23-story Tower Building of new Mile High Center, Denver.



SEA LEVEL: new 34th Street Office Building, New York City—26 stories high.

American Blower products assure ideal comfort conditions a mile high and at sea level

Although one of these new Webb & Knapp office buildings is in Denver (called the "mile-high city" because of its 5,280-ft. elevation)—and the other is in New York City at sea level—both provide year-round comfort with the same type of *dual* air-conditioning system.

Divided into two zones of operation (peripheral and interior), and including American Blower heating, cooling, and ventilating equipment—these dual systems offer flexible control for satisfying the various comfort needs of tenants. Precise air conditions are not only supplied to each floor, but also to different points across each floor!

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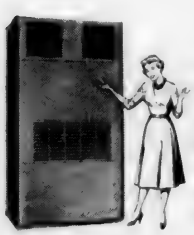
New 34th Street Office Building. Architects: Rene Brugnoni and Rudolf C. P. Boehler. General Contractor: Webb & Knapp Construction Corp. Mechanical Contractors: Kerby Saunders, Inc. Consulting Engineers: W. R. Cosentini & Assoc.



What are your air-conditioning requirements?

Whether your plans call for a central or zone system, or for all-in-one-package air conditioning (left)—American Blower can meet your every equipment need. Call our branch office near you for information.

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Air-conditioning equipment for every business

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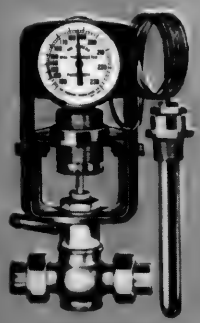

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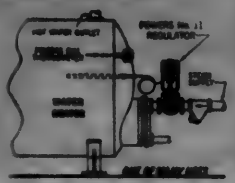

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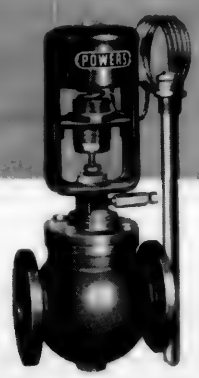

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POWERS CONTROL Since 1891

● Right type of Regulator and the right size valve is important for best control. From Powers complete line of self operating regulators and air operated temperature controllers you can be sure of getting the type best suited for your requirements. Call our nearest office or write us direct. 3400 Oakton St., Skokie, Illinois. Offices in Chief Cities.

Above: Flanged Iron Body Valve with Double Seat for sizes above 2"

THE POWERS REGULATOR COMPANY

THE MARK OF QUALITY

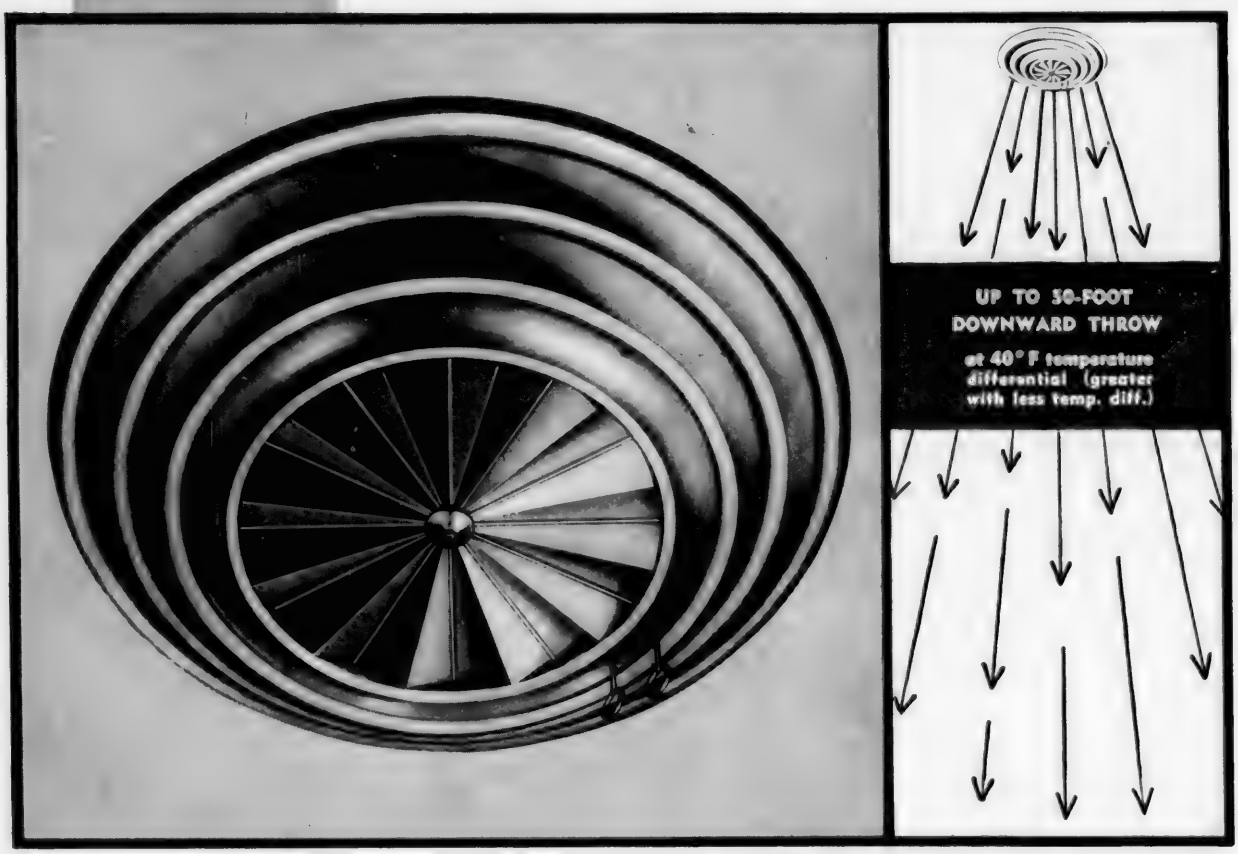
BARBER COLMAN

UNI-FLO

ENGINEERED AIR DISTRIBUTION

New Venturi-Flo Diffuser for high ceiling applications . . .

. . . complete flexibility for effective air distribution in factories, gymnasiums, auditoriums, garages, churches, lobbies . . . handles heated or chilled air



COMPLETE CONTROL of the vertical air pattern for spot heating, or for heating large areas to meet comfort requirements, is provided by the BP Venturi-Flo Diffuser. Adjustable vanes of the pattern control permit full variation of the air patterns from vertical to horizontal . . . adjustable from the floor or through the duct from the crawl space above the ceiling.

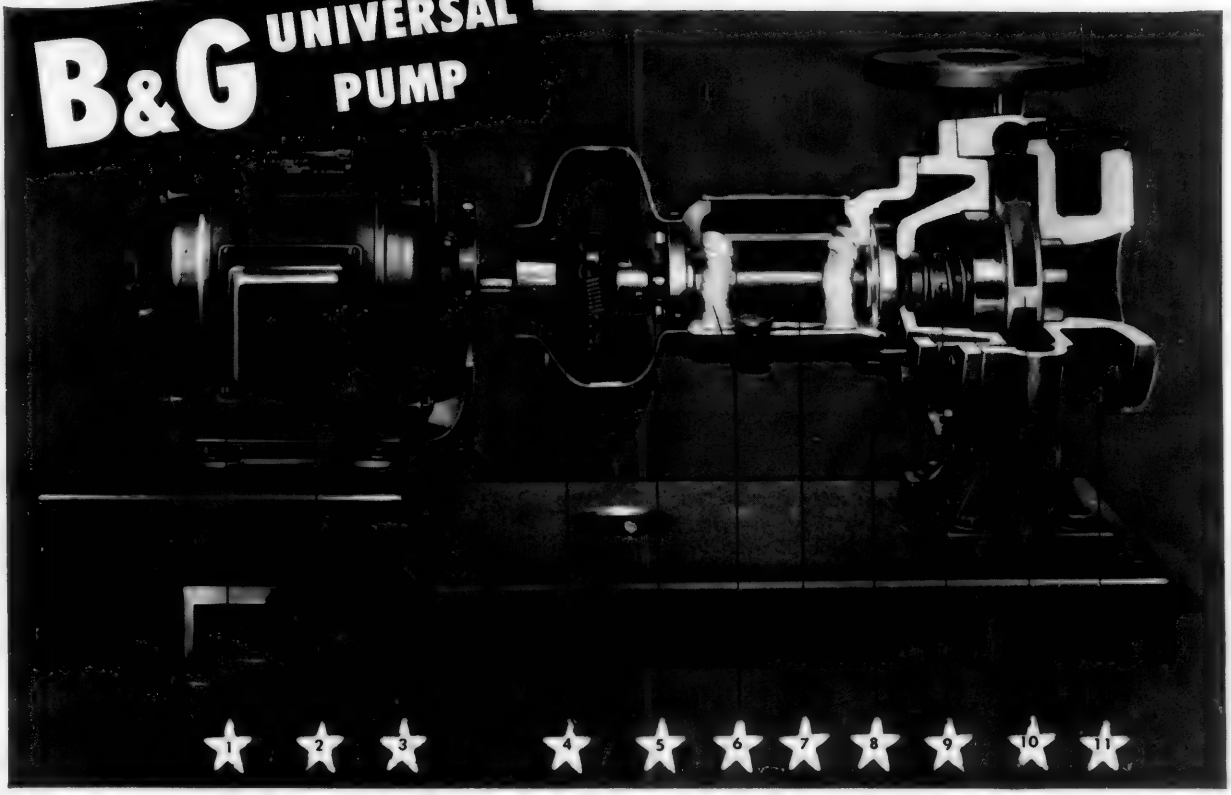
For engineering excellence, from product development to product application, come to . . .

LIKE ALL UNI-FLO EQUIPMENT, this new pioneering development has the rugged construction you can depend on . . . the efficient diffusion which assures owner satisfaction . . . the authoritative performance data you can use with confidence. Get complete specifications from your nearby Field Office, or write us . . . today!

Barber-Colman Company

Dept. B, 1102 Rock St., ROCKFORD, ILL., U. S. A.
Field Offices in principal cities

B&G UNIVERSAL PUMP



DESIGNED SPECIFICALLY FOR *QUIET* OPERATION

IN LIQUID HEATING AND COOLING SYSTEMS

No vibration eliminators or flexible connections needed

The circulating pump in a hot water heating or chilled water cooling system is the connecting link between the mechanical equipment in the boiler room and the structure itself. *Silent, vibration-less* operation is therefore the prime requirement in a pump for this type of service. The features starred above are the reasons why the B&G Universal Pump fully meets this need.

THE MOTOR

1. **Extra quiet.** The Universal Pump motor is specially constructed, tested and hand-picked for extra-quiet operation.
2. **Sleeve bearings.** Motors are equipped with oil lubricated bronze sleeve bearings—essential to silent operation and long life.
3. **Mounting.** Universal motors, through 5 HP, are NEMA ring-type mounted and completely suspended in noise-dampening rubber. All motors are drip-proof.

THE PUMP

4. **Coupler.** Self-aligning, spring-type . . . another warranty of silent operation plus excellent pump and motor protection against the stresses of starting torque.
5. **Shaft.** Big—oversized—affording large bearing surfaces. Made of special alloy steel, polished to mirror finish. Heat-treated integral thrust collar absorbs end-thrust . . . lengthens seal and motor bearing life.
6. **Lubrication.** Genuine oil circulating. No grease to channel or harden. Oil level indicator permits visual check.
7. **Sleeve bearings.** An essential for quiet, vibrationless operation and long life of both pump and motor. An outstanding Universal feature.
8. **Removable bearing frame for easy servicing.** The entire bearing frame assembly with impeller is easily removed from volute. No pipe connections to break or motor to remove . . . all the advantages of split case design. All bearing frame assemblies are interchangeable.
9. **Mechanical seal.** Positively prevents water leakage up to full design pressures. The seal is self-lubricating and features a floating seat of diamond-hard "Remite" —a B&G development.
10. **Hydraulically balanced impeller.** Balancing chamber and thrust pressure relief holes in the impeller reduce thrust to a minimum.
11. **Solid volute.** Support feet directly below volute absorb piping strains without distorting pump alignment.

Write for capacity data

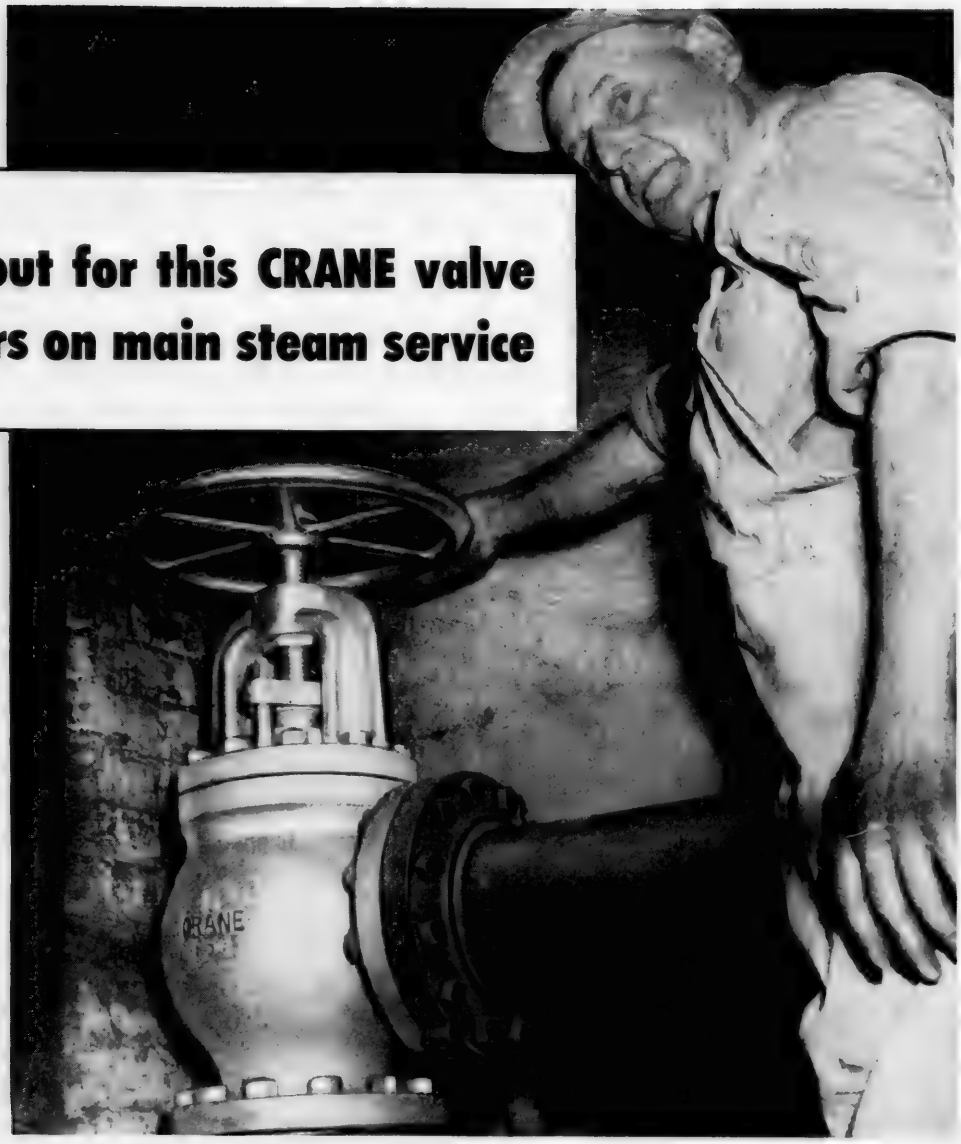
BELL & GOSSETT

COMPANY

Dept. EF-4, Morton Grove, Ill.

Canadian Licensee: S. A. Armstrong Ltd., 1400 O'Connor Drive, West Toronto

No time out for this CRANE valve in 40 years on main steam service



THE CASE HISTORY—Two Crane 250-pound iron body angle valves—6-inch (shown) and 5-inch size—scored this exceptional service record.

They were installed in 1915 on the main steam leads from boilers in the plant at Delavan, Wis., now occupied by The George W. Borg Corporation. In 40 years' uninterrupted service these Crane valves never failed to operate properly nor caused a shutdown. With but routine maintenance, they opened fully and were seated tight with ease under infrequent operation. Working pressure of boilers was originally 150 psi.—later reduced to 75 psi. This year, both valves were retired. The new replacements are Crane quality valves, of course.

Crane iron valves in particular need no introduction to thrifty buyers. In all grades, Crane iron castings generously exceed the requirements of equivalent A.S.T.M. specifications. Crane Ferrosteel, for instance, used in 250-pound valves is 35% stronger than ordinary cast iron.

In any pressure class, you'll find Crane quality outstanding. Choose from complete lines of gates, globes, angles and checks.

Your Crane Representative can give valuable help in specifying and ordering.

CRANE VALVES & FITTINGS

PIPE • KITCHENS • PLUMBING • HEATING

Since 1855—Crane Co., General Offices: Chicago 5, Ill. Branches and Wholesalers Serving All Areas

Why Arizona Public Service chose Triple-Zone Gilsulate to protect 1200-foot fuel and steam lines

Sought lifetime protection against heat loss and corrosion

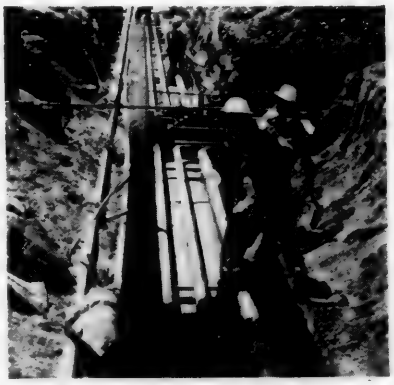
For its new Saguaro steam electric station near Red Rock, Arizona, the Arizona Public Service Company investigated several types of hot underground pipe insulation. The pipe system consists of three seamless carbon steel hot fuel and steam lines, totalling 1,200 feet, with welded joints running side by side between a 55,000-bbl. fuel oil storage tank and two 950,000 pound/hour steam generators.

Arizona Public Service Company found that GILSULATE gave the quickest, simplest and most economical system of insulation for its underground hot fuel and steam lines. Approximately 40 tons of GILSULATE were poured and tamped by 10 laborers in two 8-hour shifts — far less time and less expense than required for the other types of insulation investigated.

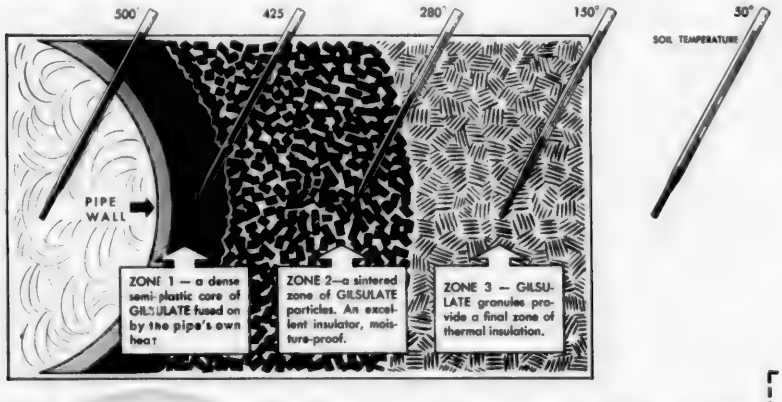
This is the experience of hundreds of other installations — *Triple-Zone GILSULATE shows the lowest cost per installed linear foot of any hot underground pipe insulation!*

Facts about Gilsulate

1. *Easy to use*—just pour, tamp and backfill...pipe heat does the rest.
2. *Forms 3 zones of protection* against heat loss and all commonly encountered hazards to hot buried pipes.
3. *Needs no sleeves* or mechanical sheaths: no mixing or special handling.
4. *Needs only* normal pipe spacing: for multiple pipe or cramped conditions.
5. *3 types* for varying temperature ranges up to 520° F.



Lines include five horizontal expansion U-bends. A 6-in. fuel oil supply line, a 4-in. fuel oil return, and a 4-in. saturated steam line leading to the fuel oil tank heater were placed side by side in a 37-in. wide trench, and covered with GILSULATE. After light tamping of GILSULATE, trench was backfilled—and the work was done.


500°
425
280°
150°
30°
SOIL TEMPERATURE
PIPE WALL
ZONE 1 — a dense semi-plastic core of GILSULATE fused on by the pipe's own heat
ZONE 2—a sintered zone of GILSULATE particles. An excellent insulator, moisture-proof.
ZONE 3 — GILSULATE granules provide a final zone of thermal insulation.

THE TRIPLE-ZONE INSULATION FOR LIFETIME PROTECTION OF HOT UNDERGROUND PIPES

GILSULATE®

AMERICAN GILSONITE COMPANY, SALT LAKE CITY 1, UTAH
Affiliate of Barber Oil Corp. & Standard Oil Co. of California

American Gilsonite Co.
134-A West Broadway, Salt Lake City 1, Utah
or
1145 East Jersey St., Elizabeth, N. J.

Send me more information on GILSULATE Insulation

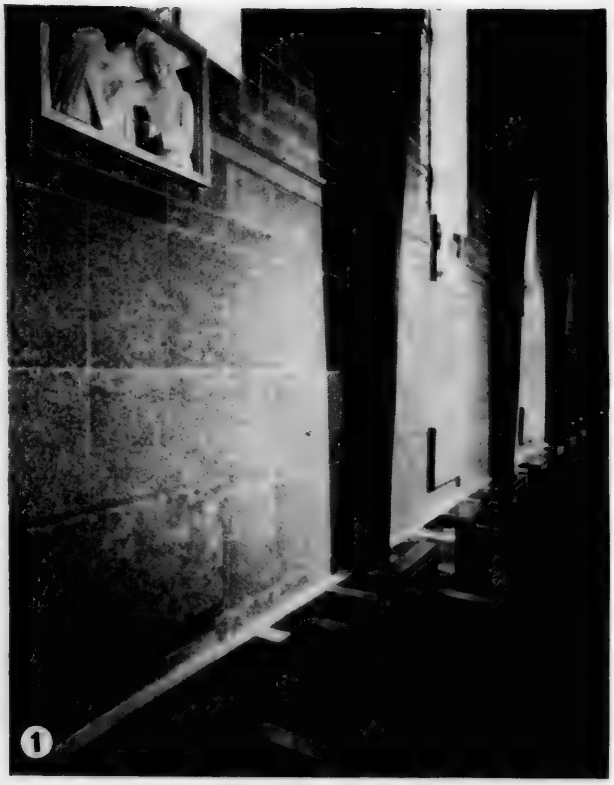
NAME .....

TITLE .....

COMPANY .....

ADDRESS .....

AHV



There's no better way to heat or ventilate large rooms or entryways than with

Modine CABINET UNITS

IN new buildings or remodeling jobs—wherever you want quiet, efficient distribution of heated or cooled air and the expense of air conditioning isn't justified—look to Modine.

Smartly-styled Modine Cabinet Units are available in five basic types—120 to 640 Edr. Some units heat with hot water, cool with chilled water. Other units are designed for steam or hot water heating systems. Any of the units can be used with or without ducts.

What's more, addition of inexpensive accessory equipment permits introduction, filtering, heating and distribution of fresh outside air for ventilation.

Whether your next job involves a store, showroom, apartment, hotel, motel, church, school or office—it will pay you to have the Modine story. Contact the representative listed in your classified phone book or write—MODINE MFG. CO., 1511 DEKOVEN AVENUE, RACINE, WISCONSIN.

ASK FOR FREE 28-PAGE BULLETIN NO. 552

Includes application and design information, physical data, installation facts and suggestions, piping arrangements and performance data. It's yours for the asking. There's no obligation.

ABOUT THE PHOTOS

1 Inverted recessed unit is connected to supply and return ducts. Cold air is drawn through window sill grille, heated and discharged across floor.

2 Free-standing unit in real estate office lobby.

3 Modern classroom has free-standing units located below windows.

4 Bank lobby features attractive partially-recessed unit.

C1292

From New York to Buffalo ...it's Sarcotherm at every point

At all 40 toll interchanges heating systems controlled by Sarcotherm Weather-Compensated Systems

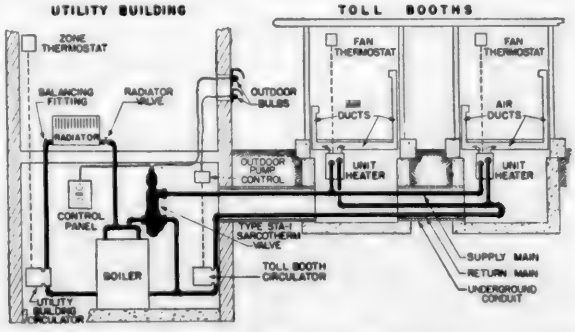
Mechanical Engineers: Syska & Hennessy, Inc., N.Y.C. • Heating Contractor: Mechanical Installations, Inc., L. I. City • Booths by Taller & Cooper, Brooklyn

HERE IN EFFECT is a heating system which stretches from the southeastern to the northwestern extremities of New York State.

It is obvious, therefore, that such a system must be so simple, so fool-proof, so utterly dependable, that any possibility of breakdown or other trouble will be reduced to an absolute minimum.

That is why *reliability* received so much attention from the Thruway's heating engineers. And that is one of the principal reasons why Sarcotherm Weather-Compensated Control Systems are installed in all 40 toll interchanges.

At each toll barrier a Sarcotherm Weather-Compensated Control System, calibrated to the design temperature for the particular locality, automatically proportions supply water to unit heaters in individual booths. Room thermostats control fan motors.



Advantages of Sarcotherm Systems

Easy to install — tailor-made drawings and diagrams of the complete system are furnished for each job.

Easy to maintain — by regular maintenance men, because of simplicity; fewer parts, such as transformers, relays.

Easy to adjust — to any desired setting.

Complete control system — including all specialties such as radiator valves, balancing fittings — all from one manufacturer, Sarcotherm. Unit responsibility.

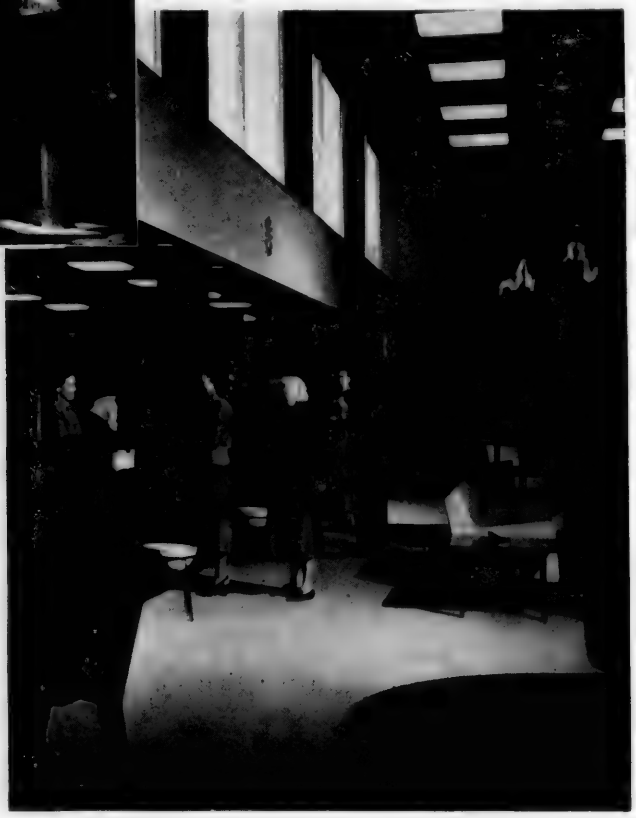
On the job assistance — to contractors from Sarcotherm's field engineers.

SARCOTHERM CONTROLS, Inc.
Empire State Bldg., New York 1, N. Y.
An affiliate of Sarco Company, Inc.

4002-C

Weather-Compensated Control Systems for **HOT WATER, RADIANT AND STEAM** *Heating*

BELOW: *Among the many features of the lobby are the clerestory illumination, the unobtrusive air diffusers, and the bas relief mural carved in wood by Buck Winn, Jr.*
Architects: Prinz and Brooks
General Contractor: Burgher Construction Co.

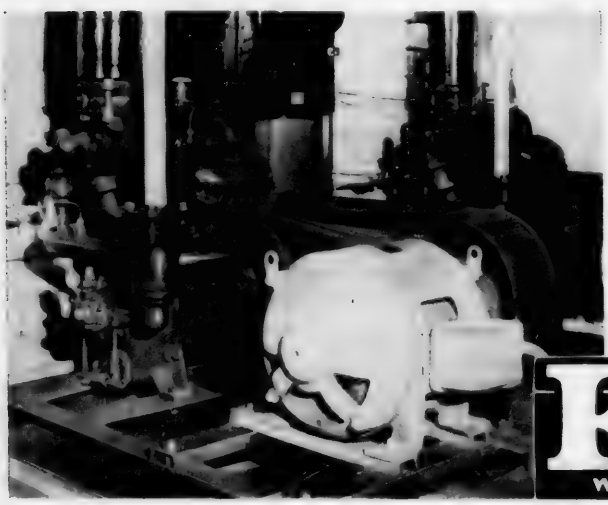


The New Look In

• Architecture
• Air Conditioning

The Oak Cliff Savings and Loan Association started eight years ago with $35,000—now has resources of $30,000,000. Its new building at Bishop and Center Streets is one of the finest in Dallas, and was awarded first honors for non-residential construction in 1954 by the Texas Society of Architects.

The entire structure, including the lobby, conference and accounting areas, community room and lounge, is air conditioned with two Frick "ECLIPSE" compressors. Each refrigerating machine is driven by a motor of 40 horsepower.



When you want the ultimate in quality and dependability . . . whether for air conditioning, refrigeration, ice making or quick freezing . . . specify FRICK.

Get quotations now on the equipment you need: Branch Offices and Distributors in principal cities, the world over.

DEPENDABLE REFRIGERATION SINCE 1882
FRICK CO.
WAYNESBORO, PENNA. U.S.A.

Skidmore Pumps

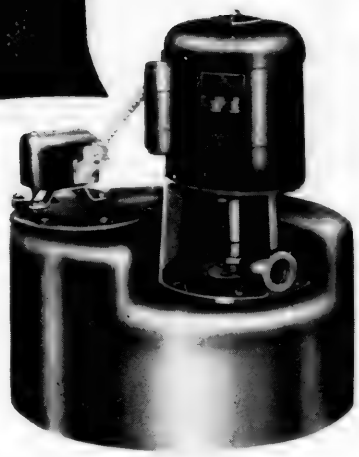
Here are the answers to— your Heating Pump Problems

- Available in capacity range from 500 to 10,000 sq. ft. E.D.R. and discharge pressures from 10 to 40 lbs.

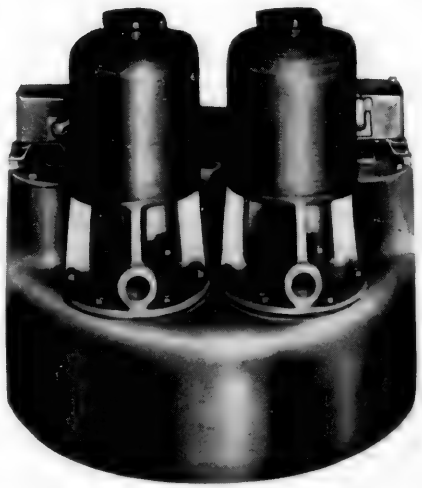
Announcing!

NEW TYPE CVS

This New Skidmore CVS Condensate Pump more than meets the requirements of the industry. Quality constructed throughout . . . offering a greater range of discharge pressures—from 10 to 40 lbs. Featuring—mechanical shaft seal — eliminating any possible leakage from pump shaft. New unit still retains the former compact design, plus lightweight construction. Pump can be installed in limited space . . . on floor level or in pit . . . easily inspected without disturbing piping. Duplex unit is furnished with either two float switches or automatic alternator. Pumps are completely assembled at factory and ready for shipment. Contact your nearest Skidmore Representative or write for bulletin No. 21-B.



SINGLE UNIT—CONDENSATE PUMP



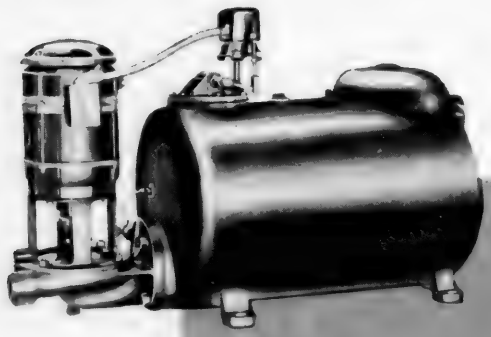
DUPLEX UNIT—TWO FLOAT SWITCHES

MORE FAMOUS SKIDMORE PUMPS

SKIDMORE VERTICAL TYPE "CVS" CONDENSATION PUMPS

SKIDMORE PUMPS have set a standard for performance and dependability since 1921.

MAINTAINED SKIDMORE PUMPS EFFICIENCY

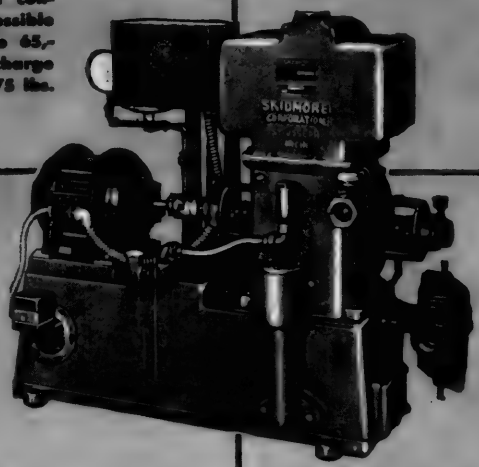


TYPE "VC" PUMP

This Skidmore Condensate Pump is sturdy cast iron construction—low inlet connection — easily accessible — capacities, 1,000 to 65,000 sq. ft. E.D.R. discharge pressures from 10 to 75 lbs.

TYPE "UV" PUMP

Designed for low return installations — pump is bolted to sump type receiver—capacities, 2,000 to 40,000 sq. ft. E.D.R. and discharge pressures from 10 to 75 lbs.



SKIDMORE VACUUM PUMP—SINGLE UNIT

(ALSO FURNISHED IN DUPLEX)

MAINTAINED EFFICIENCY

. . . automatically adjusts itself to the varying conditions.

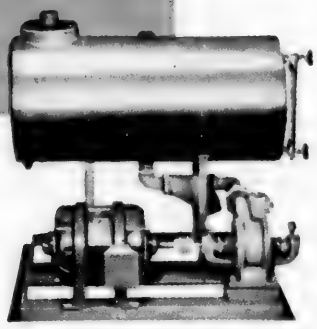
Low return lines . . . reduces installation cost, often eliminating the necessity of a pit.

Capacity remains constant year after year . . . eliminates adjustments and costly repairs.

TYPE "HS" PUMP

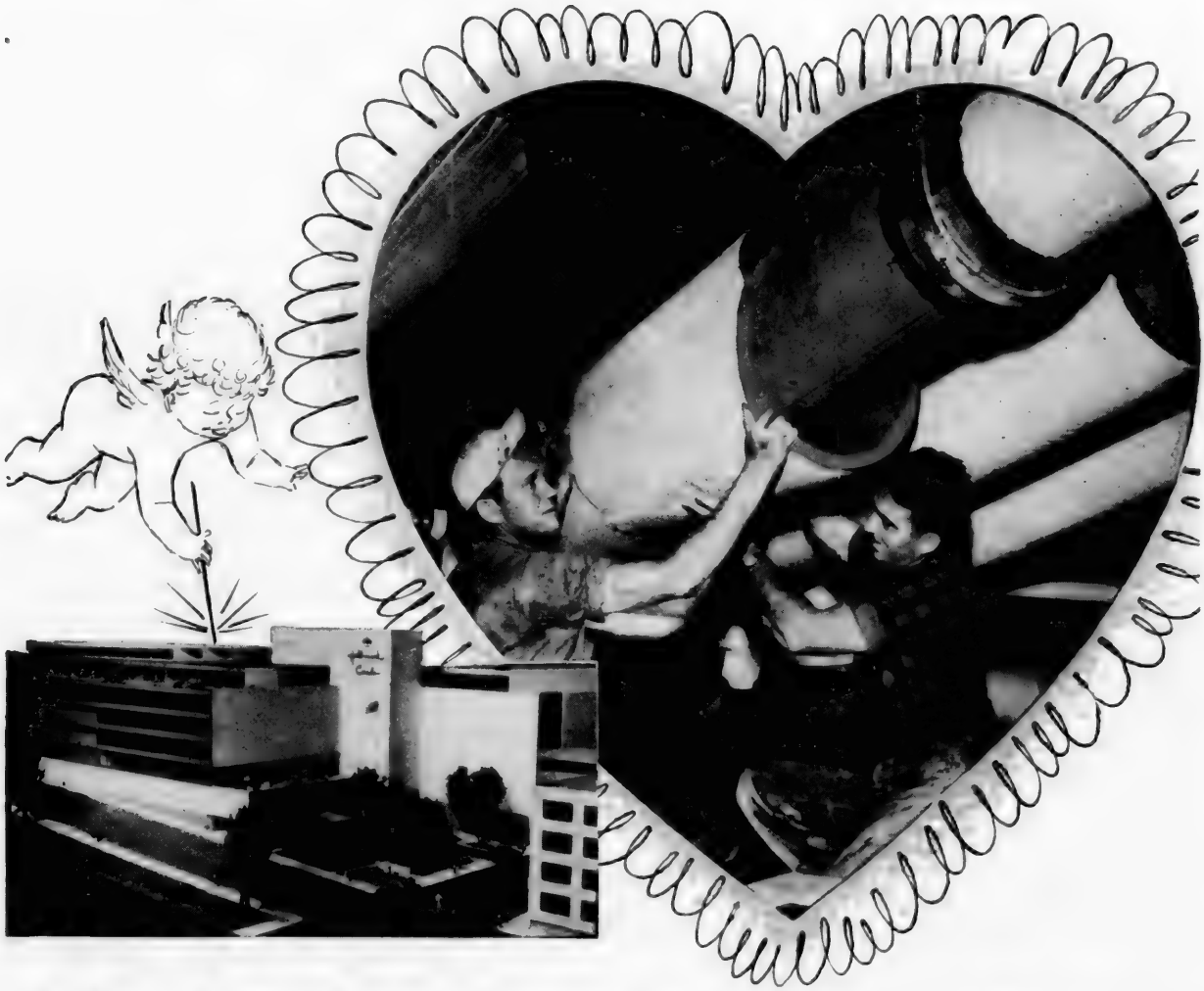
Sturdily constructed for dependable service at small investment —capacities, 1,000 to 65,000 sq. ft. E.D.R. discharge pressures from 10 to 75 lbs.

SKIDMORE — PUMPS



TYPE "TM" PUMP

Completely assembled on either steel or cast iron base — capacities, for boilers up to 250 H.P. discharge pressures to 150 lbs.



Hallmark Cards cared enough to put on the very best . . .

GUSTIN gb BACON SNAP*ON

One of the Midwest's outstanding buildings is the new Hallmark Cards building in Kansas City, Missouri, home of the famous manufacturer of greeting cards for those "who care enough to send the very best".

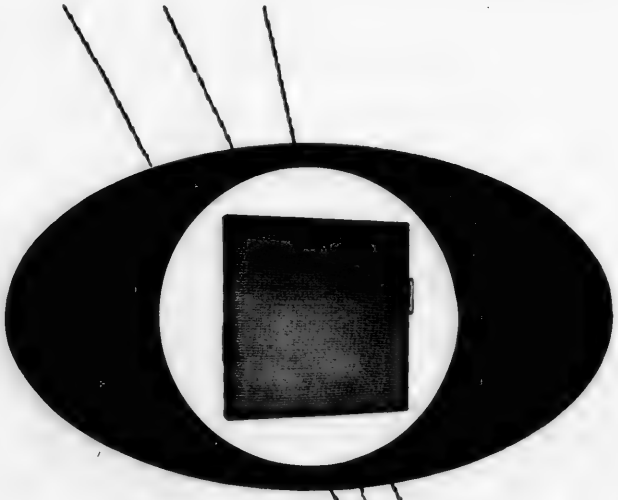
Inside this enormous structure, 50,000 feet of hot and cold lines are insulated with G-B Snap*On pipe insulation—the new one-piece molded pipe insulation of fine glass fibers. Thermally, it is superior to any comparable product. It is also far lighter in weight, far easier to handle, far more economical to apply. One-piece sections are available plain or with muslin for heated piping, or with vapor barrier jackets adhered for chilled lines. As the photo indicates, they go on the pipe as quickly as you can say "Snap*On"—and they will do their job indefinitely because they are as permanent as glass itself.

Modern plants of every type throughout the country are selecting Snap*On for chilled lines or heated piping where temperatures do not exceed 350° F. You, too, can put on "the very best" and save *money in the bargain!* Write this very day for samples and complete technical literature.

GUSTIN-BACON *Manufacturing Company* GUSTIN gb BACON

Thermal and acoustical glass fiber insulations • Pipe couplings and fittings • Molded glass fiber pipe insulation

222 W. 10th ST., KANSAS CITY, MO.



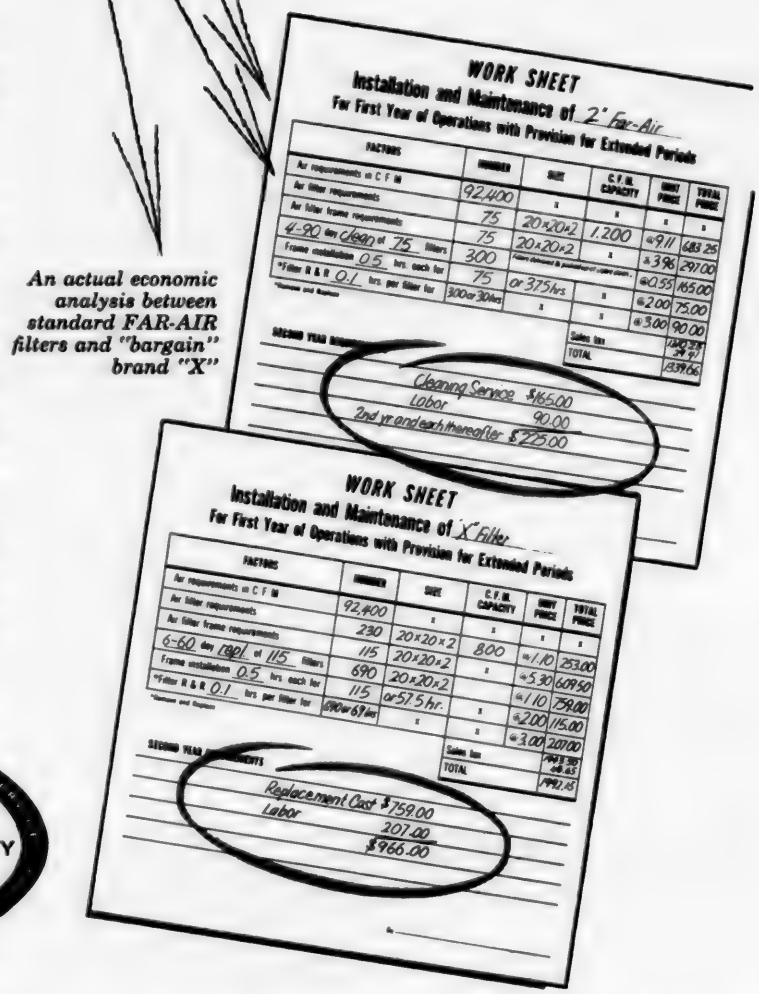
NOW—
you can be sure you are right

Because most filters are efficient at cleaning air, you are reasonably sure of getting a satisfactory job when you install an established make. The service life of your expensive air conditioning machinery and the comfort of your building depend on the ability of relatively low cost filters to do their job.

FARR Company, as one of the country's leading filter manufacturers, wants to insure that your are getting the most value out of your present filters, regardless of make. Therefore, they will send a field engineer who is an air filtration expert, to carefully analyze your air filters and submit a factual, written report like the one shown, on his findings. Often he can make suggestions that will greatly increase your filtration efficiency and save a substantial amount of money in operating costs.

FARR Company is making this service available to you on a no cost basis because it will increase your appreciation for the function of the often-neglected air filters. It will point out the importance of buying standard brand filters. It will in some cases result in sales for FAR-AIR filters . . . and that is important, too.

Why not try this service? It is factual, honest and subject to favorable comparison by any reputable manufacturer. Write today to Farr Company, P.O. Box 45187, Airport Station, Los Angeles 45, Calif.


WORK SHEET
Installation and Maintenance of 2" Far-Air
For First Year of Operations with Provision for Extended Periods
Cleaning Service $165.00
Labor 90.00
2nd yr and each thereafter $225.00
WORK SHEET
Installation and Maintenance of X Filter
For First Year of Operations with Provision for Extended Periods
Replacement Cost $759.00
Labor 207.00
$966.00

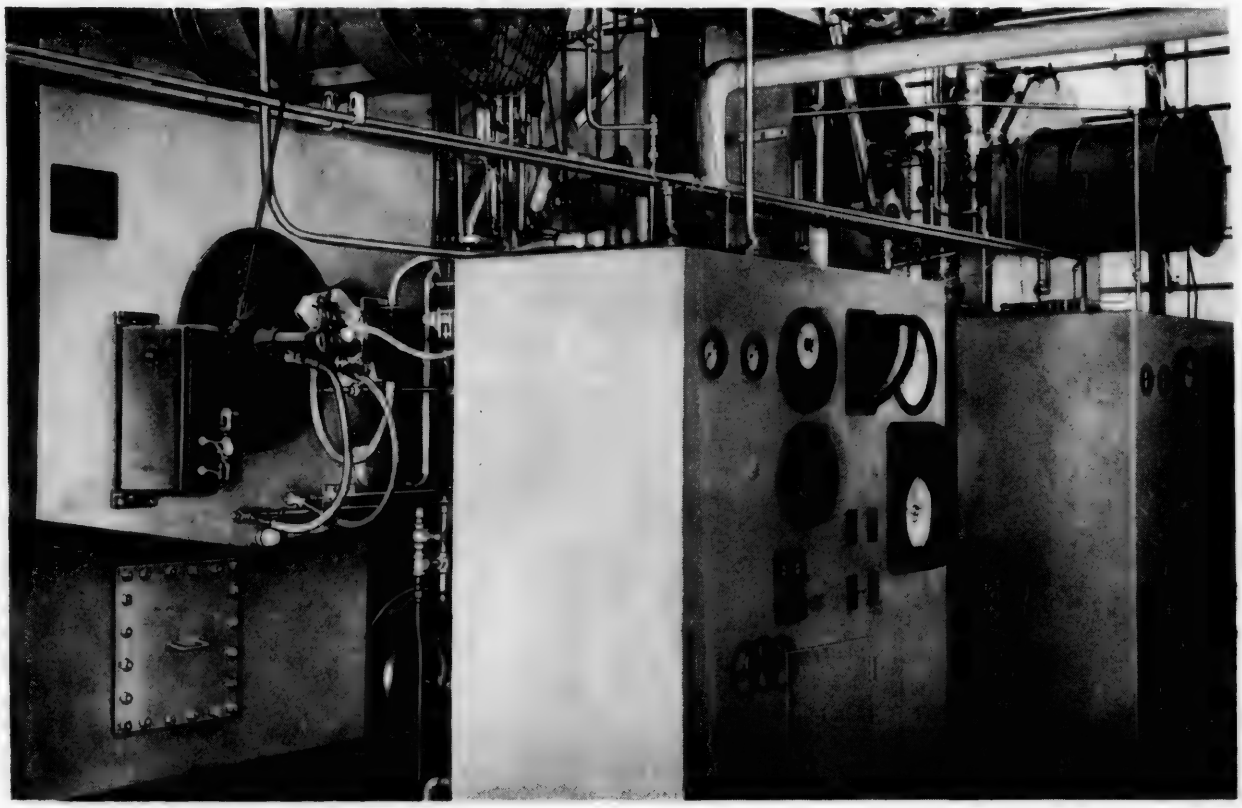
An actual economic analysis between standard FAR-AIR filters and "bargain" brand "X"

FARR COMPANY
NO COMPROMISE ON QUALITY
Los Angeles, New York, Chicago
New Orleans

keeping steam cheap . . .

Rx for HOSPITALS

with the B&W Type FM Boiler



These two Type FM, B&W Integral-Furnace Boilers supply steam for all heating, cooking, and laundry requirements at a large midwestern hospital.

COST-SAVING FEATURES

- Saves Erection Time and Cost
- Meets Wide Range of Service
- Handles Quick Load Changes
- Fast Steaming
- Low Maintenance
- Easy Accessibility
- Burns Oil and/or Gas
- Saves Fuel
- Saves Space
- Safe, Automatic Operation

Among the many enthusiastic users of the shop-assembled B&W Integral-Furnace Boiler, Type FM, hospitals have found it uniquely suitable to meet their varied steam requirements. Typical of the FM Boilers now serving hospitals in various parts of the country is this dual-unit installation, which is supplying low-cost steam for all heating, laundry, and cooking requirements at a midwestern institution.

Easy to install, this compact B&W steam generator is delivered complete with firing equipment and controls . . . is ready to skid or lift into position, hook-up, and place in operation. Push-button starting and stopping and automatic handling of load variations simplify operation . . . make the Type FM Boiler ideal for small to medium-sized installations where operators have additional duties. Even for some larger installations it has been found practical and more economical to have a multiple-unit, Type FM installation rather than one or more large boilers requiring complete field erection and close operating supervision.

Available in standard sizes for loads ranging between 2900 and 40,000 lb of steam per hr at pressures to 235 psi, this efficient B&W unit is already enjoying wide popularity with users in a broad range of industrial, commercial, institutional, and other classifications . . . is in service or on order for a total steam capacity over 12,000,000 lb per hr.

For a detailed illustrated description of how you can benefit from the cost-saving features of the B&W Type FM Boiler, write for Bulletin G-76A. The Babcock & Wilcox Company, Boiler Division, 161 East 42nd St., New York 17, N. Y.

BABCOCK & WILCOX

BOILER DIVISION

G-611

Leading architects, engineers and contractors know this about air conditioning...

You always protect your reputation when you specify the brand that has an outstanding reputation

Airtemp

COMMERCIAL AND INDUSTRIAL AIR CONDITIONING

Reputation—man's *priceless* possession!

One of the best ways to maintain your own reputation is to be sure you specify products with good names and performance records. Such a name is AIRTEMP—product of famous Chrysler engineering—for 21 years a leader and pioneer in air conditioning.

AIRTEMP'S advanced engineering and precision manufacturing are your *guarantee* of outstanding performance. When you deal with AIRTEMP, you get the advisory service of the best engineers of Airtemp Construction Corporation. And you get the follow-through benefit of a nation-wide network of trained service personnel and facilities.

Our representatives will be pleased to advise you on which is the best system for your every purpose. And whenever you specify AIRTEMP, you can rest assured your clients will be happy. They will find that operating costs are unusually low—thanks to efficient, modern AIRTEMP design.

Write for full information. For complete details on what AIRTEMP offers you, write to: Airtemp Construction Corporation, Dayton 1, Ohio.

Airtemp Builds Air Conditioning To Fit Every Requirement

From installations like these comes convincing proof of Airtemp dependability!

COMMERCE COURTS
(Office Building) Commerce Court and Raymond Blvd., Newark, N. J. Architect and Engineer: Henry Boyer

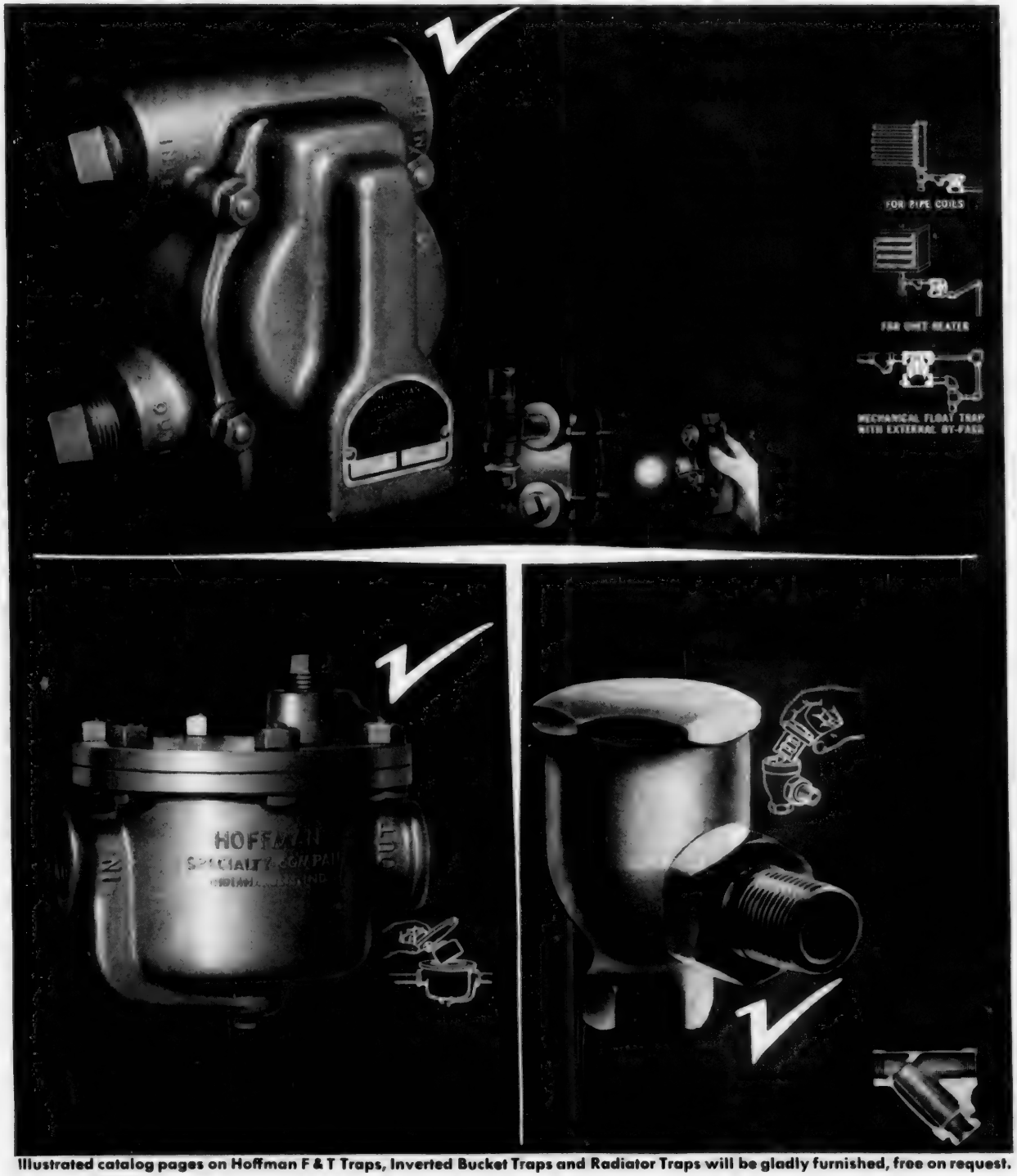
TITLE GUARANTY BUILDING, St. Louis, Mo. Architect: Raymond E. Maritz; Consulting Engineers: Leo S. Weil and W. B. Moses; Mech. Engineers: Brussel & Viterbo; Air Conditioning Contractors: General Installation.

THE *FORWARD* LOOK IN AIR CONDITIONING

AIR CONDITIONING • HEATING FOR HOMES, BUSINESS, INDUSTRY

Airtemp
CONSTRUCTION CORPORATION
SUBSIDIARY OF CHRYSLER CORP.

STOP STEAM WASTE...*these 3 Ways*



Illustrated catalog pages on Hoffman F & T Traps, Inverted Bucket Traps and Radiator Traps will be gladly furnished, free on request.

HOFFMAN Steam TRAPS

HOFFMAN SPECIALTY MFG. CORP.

VALVES, TRAPS, VACUUM AND CONDENSATION PUMPS, FORCED HOT WATER HEATING SYSTEMS

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TRUST *your future reputation* to LAWLER CONTROLS

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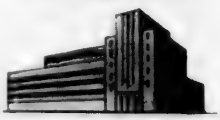
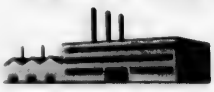
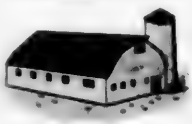


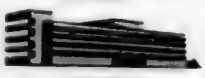
COMMERCIAL BUILDINGS



PROCESSING PLANTS



DAIRIES



INSTITUTIONS

SHIPS

. . . Wherever Steam is Used

Type "S" Thermostatic Temperature Regulator for automatically regulating the flow of liquid or steam through a valve . . . such as in the diesel engine illustrated above.

Lawler's "Performance-Tested" design combines pioneering experience with engineering leadership. The use of specially chosen metals assure YOUR customers years of positive, accurate temperature control with lowest maintenance cost . . . the best insurance YOUR REPUTATION can have.

The Lawler Line **of Thermostatic Controls**

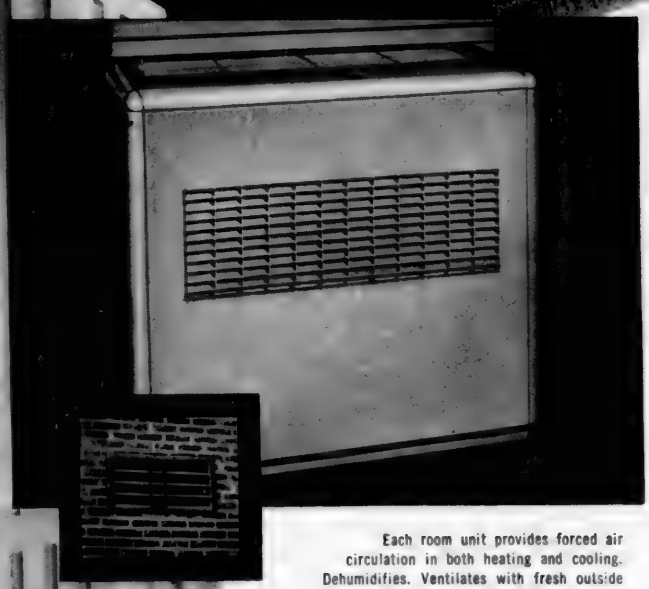
LAWLER AUTOMATIC CONTROLS, INC. 453 North MacQuesten Parkway, Mount Vernon, N. Y.

Only the best thing that ever happened

for year-'round room comfort in commercial and institutional buildings

new RECESSED AIR CONDITIONER

BY **Mueller Climatrol**



Each room unit provides forced air circulation in both heating and cooling. Dehumidifies. Ventilates with fresh outside air, or exhausts stale inside air. Installed on outside walls (most often under windows), the handsome unit extends only 15½ inches into the room. It arrives prime-coated . . . ready for painting to match room decor. Rust-proof and attractive exterior louvre opening (see insert) is flush with the outside of the building.

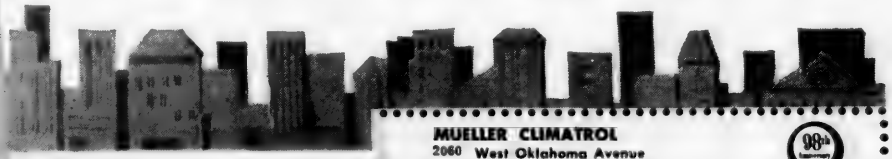
HEATS
with steam or hot water.

COOLS
with its own air-cooled refrigeration cycle.

CONTROLS
heating and cooling in each individual room with built-in thermostats.

COSTS
about half as much installed as a complete central cooling system alone.

IDEAL
for both new and existing buildings, single or multi-story.



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Please send me illustrated literature about the new recessed year'-round room air conditioner.

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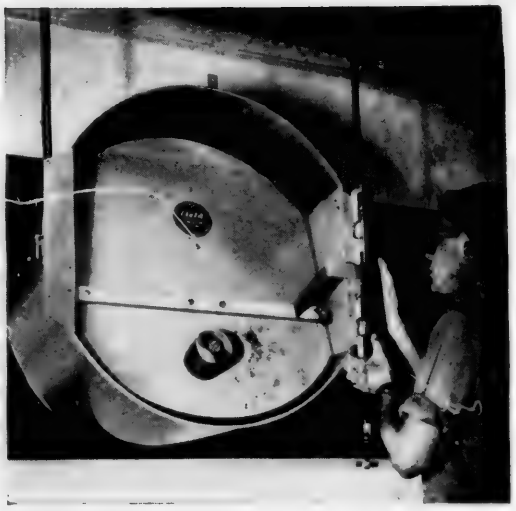
DEPENDABLE,

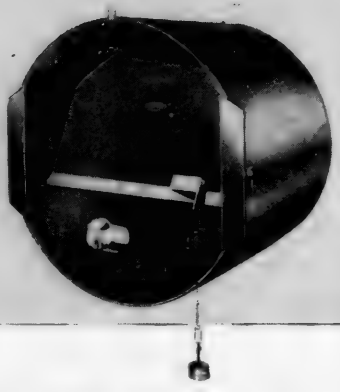
PRECISELY ACCURATE

Draft Control

for coal fired, oil fired, gas fired or gas-oil fired

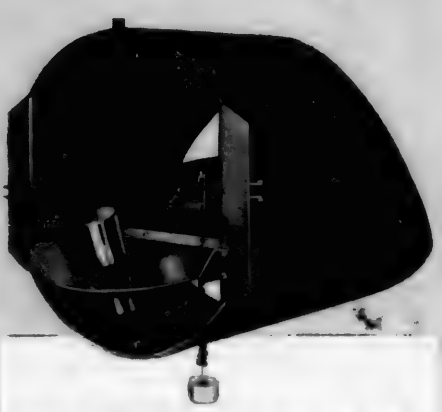
HEATING PLANTS





FIELD TYPE "M" for coal and oil fired heating plants

Heavy duty commercial model in 28" and 32" sizes. Heavy, rigid construction assures long, trouble free service. Stainless steel knife edge bearing for permanent sensitivity. Also available in 6" through 24" sizes for domestic and commercial installations. First choice of heating men — the round control you can level on any flue.



FIELD TYPE "MG" for gas and gas-oil fired heating plants

A heavy duty, precision built control in sizes 8" through 32" for commercial and industrial installations. Stainless steel knife edge bearings for permanent sensitivity. Gate opens inward to regulate updrafts, and outward to relieve down-drafts. Optional safety switch available where codes require. Fully proven, accepted virtually everywhere.

They're real HEAVYWEIGHTS

Compare the weight of a Field Control to any other available. Here is proof of the massive, welded construction, long, vibration-free service, that permits Field's supreme accuracy.

Size Control	Thickness of Parts Gate	Side Plates	Ring	Collar	Wt. without Crtn. or Crate
14 M	16 Ga.	16 Ga.	⅜ x 2"	22 Ga. Galv.	19#
16 M&MG	16 Ga.	16 Ga.	⅜ x 2"	18 Ga. Galv.	28#
18 M	16 Ga.	16 Ga.	⅜ x 2"	18 Ga. Galv.	35#
20 M&MG	16 Ga.	16 Ga.	½ x 2"	18 Ga. Galv.	41#
24 M&MG	14 Ga.	16 Ga.	½ x 2"	18 Ga. Galv.	65#
28 M&MG	14 Ga.	14 Ga.	½ x 4"	14 Ga. H.R.S.	110#
32 M&MG	14 Ga.	14 Ga.	½ x 4"	14 Ga. H.R.S.	140#

field

FIELD CONTROL DIVISION

of H. D. CONKEY & COMPANY, Mendota, Ill.

Affiliates

Conco Building Products, Inc. • Brick, Tile, Stone
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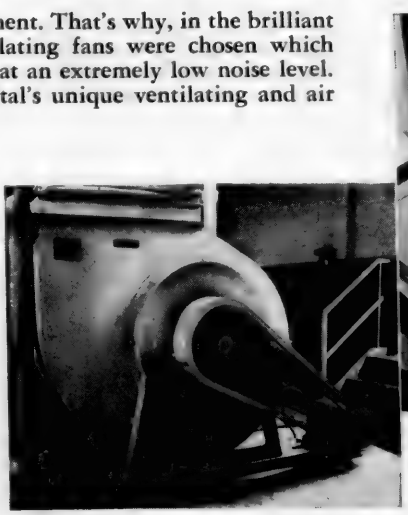
The beautiful new Long Island Jewish Hospital, New Hyde Park, L.I., N.Y., Louis Allen Abramson, Architect; Eugene D. Rosenfeld, M.D., Consultant and Executive Director; Slocum & Fuller, Mechanical Engineers; Jarcho Bros., Inc., Mechanical Contractors; Turner Construction Co., General Contractors.

a good reason for specifying "BUFFALO" ventilating fans!

A hospital, of all buildings, needs quiet mechanical equipment. That's why, in the brilliant planning of this new Long Island Jewish Hospital, ventilating fans were chosen which would not only deliver to complete satisfaction, but do it at an extremely low noise level. Thus, "Buffalo" Fans were specified as part of the hospital's unique ventilating and air conditioning system.

In summer, cold well water is circulated thru radiant panel piping and thru "Buffalo" "PC" Air Conditioning Cabinets in the ventilation system. In winter, fans supply warm air which, in conjunction with the radiant panel heating system, provides adequate comfort throughout the hospital.

For your air requirements, choose the fans that so many hospitals, institutions, commercial and industrial firms choose for quiet operation—efficiency—dependability—in short, for "Q" Factor* performance.



At right, one of the super-quiet "Buffalo" Limit-Load® Fans keeping operating rooms of the hospital dependably ventilated. Write for Bulletin F-101 for details on this proved line of fans.

Above, a group of "Buffalo" Belted Vent Sets are used for exhausting and Limit-Load® Fans supply clean, tempered air to hospital service areas.

"Buffalo"

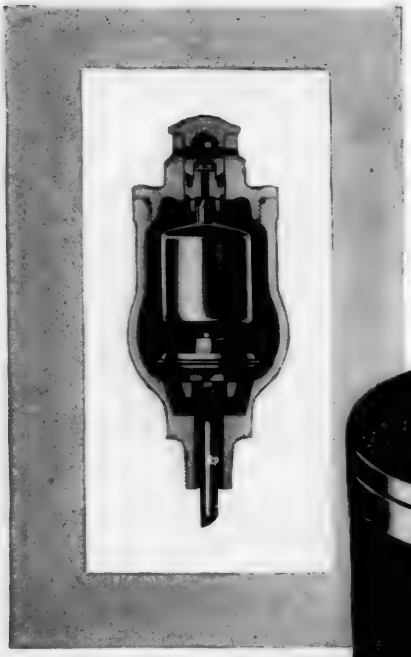
**The "Q" Factor — the built-in Quality which provides trouble-free satisfaction and long life.*

BUFFALO FORGE COMPANY

BUFFALO, NEW YORK

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

COOLING HEATING PRESSURE BLOWING



No. 5 Rapid Vent. Float and thermostatic construction. Designed for use at the end of steam mains, tops of risers and other similar locations on vapor and one pipe vacuum systems where the maximum venting requirement does not exceed one cubic foot per minute at 5 psi.

No. 6 Quick Vent. Thermostatic only. Designed for installation at high points in the piping where there is not sufficient room for the No. 5 Vent or where a float is not needed. Same venting capacity as No. 5.

No. 50 Air Vent. Float only. Designed to remove air and gases automatically from hot or cold water tanks, coils or piping, liquid pump systems or similar applications where it is necessary to vent air rapidly. Maximum working pressure, 125 psi.

No. 55 Air Vent. Float and thermostatic construction. Is capable of expelling large volumes of air without passage of water or steam and is designed for use on steam pressure vessels or systems. Maximum working pressure, 125 psi.

No. 7 Air Eliminator. Float and thermostatic construction. Expecially suitable for installation at the ends of steam mains, return piping and tops of risers where it is necessary to expel a large volume of air from the system. Suitable for working pressures up to 15 psi.

A well placed air vent can work a heating miracle!

In a Wilmette Illinois Building, an outwardly well-engineered vacuum system had been a headache for years. Then, last winter, along came a heating man who quickly sized up the situation and said with real conviction: "Put a Marsh No. 5 Vent right there!"

That did it! One inexpensive vent cleaned up a spotty, erratic condition, that a number of expensive alterations had failed to touch.

Unusual? Not in the least: over the years we have seen a lot of wonders worked by installing the right kind of Marsh air vent in the right spot. A number of these dependable vents are illustrated here . . . products that express an unrivaled accumulation of knowledge in dealing with air venting problems.

Marsh air vents are fully covered by the Marsh Heating Specialty Catalog along with Marsh Traps and Valves. Your local Marsh man will be glad to work with you in applying Marsh Vents effectively.

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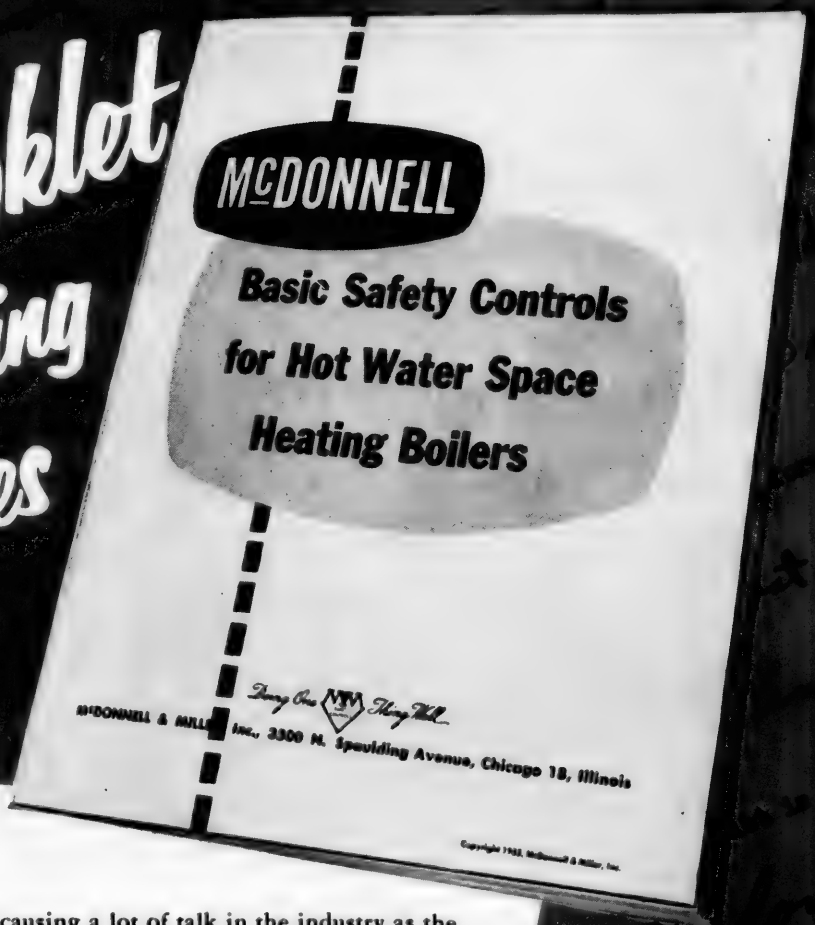
MARSH

Quality Heating Specialties since 1865

Get this booklet that's getting rave notices


McDONNELL
Basic Safety Controls for Hot Water Space Heating Boilers
Doing One Thing Well
McDONNELL & MILLER Inc., 3500 N. Spaulding Avenue, Chicago 18, Illinois

THIS ILLUSTRATED BOOKLET is causing a lot of talk in the industry as the first authoritative discussion of a most important subject. Essentially it is an engineering booklet rather than a product catalog. In simple, easy-to-follow style it tells why safety devices are needed on hot water space heating boilers, which ones to use, and how to select them. Information every heating man should have.

THE COMMENTS YOU SEE HERE came from men in the heating industry after they read this booklet. We mailed out some copies as it came off the press. This is only a small sample of the enthusiastic responses we received.

THE COUPON YOU SEE BELOW is for you, to get your copy of this new booklet. Many local codes and federal specifications now call for the safety devices it recommends. If you haven't had a copy yet send back the coupon right now.

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when steam travels a **LONG** way . . .

San Francisco International Airport

Heating Contractor: Anderson & Rowe, Inc.: Architect: W. P. Day & Harry Michelson, Assoc. Engineer: Clyde Bentley.

KEWANEE reserve plus rated boilers

...guard against heat loss

In airports, where height is a hazard, buildings hug the ground. They grow OUT instead of UP. And because steam must travel great distances, there can be a marked loss of heat in long piping runs. Here space is valuable too, so areas to house boilers must be kept compact. Such was the problem at the San Francisco International Airport. Solution called for space-saving boilers large enough to supply steam to the remote corners of the sprawling airport buildings, and with sufficient reserve to compensate for transmission heat loss. Kewanee reserve plus rated boilers were selected because they offered a compact installation with enough power to guard against heat loss, yet maintain required temperatures. Kewanee Boilers assure savings in fuel and maintenance since they operate at "cruising speed" with 50% more power built-in to provide for piping, pickup and additional capacity requirements. So be safe—be sure—select Kewanee.

Two #588 125# Kewanee Firebox Boilers with combination gas & oil burners.

KEWANEE BOILER DIVISION
of American Standard
101 FRANKLIN STREET KEWANEE ILLINOIS

KEWANEE BOILERS

You can depend on Kewanee Engineering

Here's where you get the answers to pipe problems

● Look under "The Youngstown Sheet and Tube Company" in one of these alphabetical or classified phone books.

They represent the 28 conveniently located district sales offices Youngstown maintains across the country. Offices staffed by men who are specialists in steel and who know pipe. They understand **your** problems and are qualified to help you get the pipe you need.

If you aren't in touch now with a Youngstown pipe distributor, just call the Youngstown district office nearest you and we will help you solve your pipe problems.

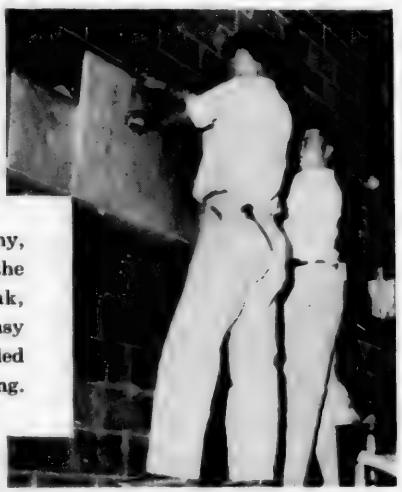
QUALITY YOUNGSTOWN SERVICE

THE YOUNGSTOWN SHEET AND TUBE COMPANY *Manufacturers of Carbon, Alloy and Yoloy Steel*

General Offices Youngstown, Ohio District Sales Offices in Principal Cities.

SHEETS - STRIP - PLATES - STANDARD PIPE - LINE PIPE - OIL COUNTRY TUBULAR GOODS - CONDUIT AND EMT - MECHANICAL TUBING - COLD FINISHED BARS - HOT ROLLED BARS - WIRE - HOT ROLLED RODS - COKE TIN PLATE - ELECTROLYTIC TIN PLATE - BLACK PLATE - RAILROAD TRACK SPIKES - MINE ROOF BOLTS

INSULATION news from L·O·F GLASS FIBERS COMPANY



Wayne Johnson, of Johnson Insulation Company, used Super·Fine to insulate ducts for the Northwood Shopping Center in Royal Oak, Michigan. He found Super·Fine lightweight, easy to handle and cut—yet so strong it could be pulled between the ducts and walls without tearing.

Super·Fine's low installation cost means big business for contractors!

Fast installation combined with high insulating efficiency can clinch the contract for you.

Super·Fine's millions of fine glass fibers form countless dead air cells which provide highly efficient insulation. It is pleasant to handle—fast and easy to apply. It cuts readily with an ordinary knife, needs no special measuring or fitting, can quickly be wrapped around ducts and supporting hangers. Contractors find that workmen can apply more Super·Fine per day than other types of insulation.

You save on storage space, too, because Super·Fine comes in compressed rolls up to 72" wide, in all standard thicknesses and roll lengths. They take up less space, yet the insulation springs back to full thickness when unrolled.

There's big business ahead for you when you discover how Super·Fine can help you save on duct-application costs. Check your Yellow Pages for the nearest distributor or write: L·O·F Glass Fibers Company, Dept. 63-26, 1810 Madison Avenue, Toledo 1, Ohio.

LOF GLASS FIBERS
SUPER-FINE INSULATION

L·O·F GLASS FIBERS COMPANY

TOLEDO 1, OHIO

Makers of glass fibers by the exclusive "Electronic-Extrusion" process

NEW HI-VALVE Aircoustat

Quiets ALL Noise in High Velocity Systems

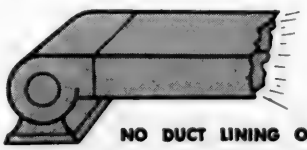
COMBINES QUIET PRESSURE REDUCING VALVE WITH REVOLUTIONARY AIRCOUSTAT SILENCER IN ONE ENGINEERED PACKAGE

Here at last is the practical, economical solution to the three noise problems which have plagued consulting engineers and contractors on all high velocity air conditioning systems: fan noise, valve noise and duct noise.

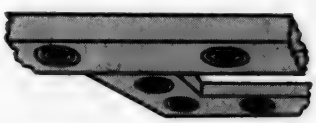
Specially designed and acoustically engineered to provide *complete* noise attenuation, Hi-Valve Aircoustat combines a silent flow pressure reducing valve with the jet engine type Aircoustat silencer which has revolutionized the air conditioning field.

Easily installed in branch ductwork ahead of the diffusers, Hi-Valve Aircoustat eliminates the need for expensive duct line mufflers and high velocity diffuser units . . . effecting substantial savings in space and on equipment and installation costs.

Write for complete information on Hi-Valve Aircoustat . . . the space-saving "all-in-one" unit which is engineered to take the guesswork out of High Velocity System silencing.



NO DUCT LINING OR HIGH VELOCITY DIFFUSER UNITS



HANDLES UP TO 3,000 CFM

Hi-Valve Aircoustats are installed directly in the ductwork, eliminating the need for duct lining and high velocity diffuser units. Because of the high capacity, a single unit can handle silencing and pressure reduction for up to 3,000 C.F.M. and is adaptable to split systems as well as single diffuser operation.

Use of easy-to-install Hi-Valve Aircoustat eliminates hit-or-miss silencing . . . assures complete attenuation and accurate pressure control.

Versatile Hi-Valve Aircoustat is available for small-duct systems and is readily adaptable to pneumatic control.

Quiets All 3 Noises with a Single Unit Hi-Valve Aircoustat provides acoustically engineered, single-unit silencing of *all* high velocity system noises: fan noise, valve noise and duct noise.

Mail this coupon TODAY ▶▶▶

SILENCE SERVICE

Industrial Sound Control Inc.
45 Granby Street, Hartford 12, Conn.

INDUSTRIAL SOUND CONTROL, INC.
45 Granby St., Hartford 12, Conn.
Please send me more information on Hi-Valve Aircoustat.

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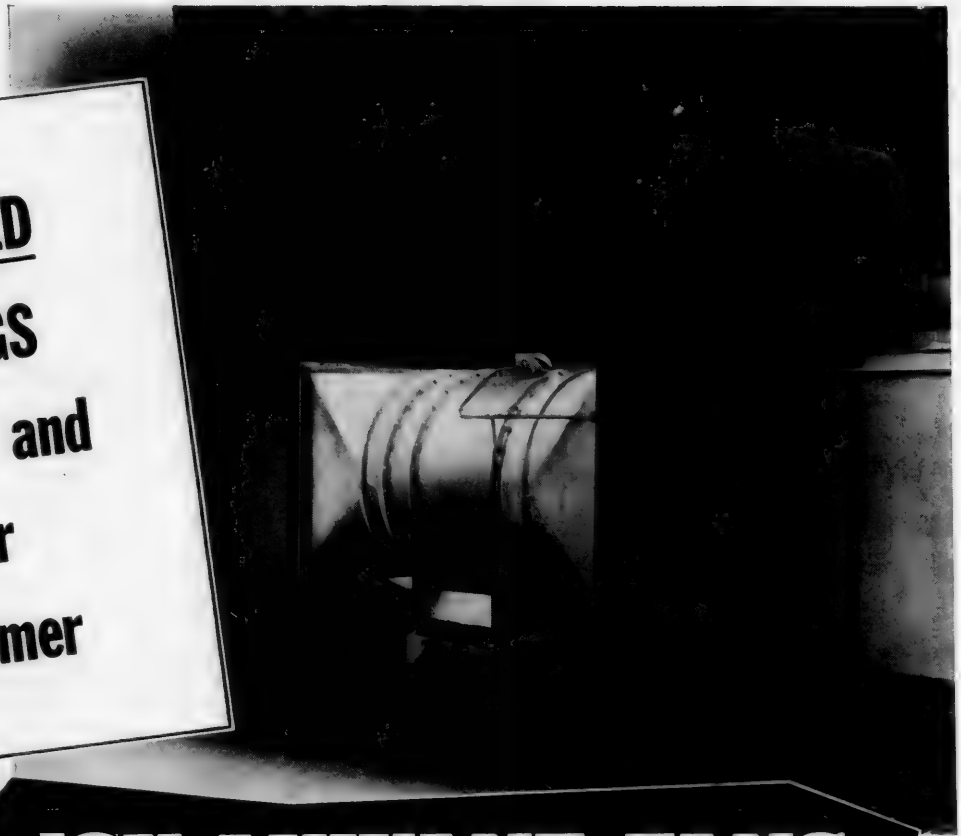
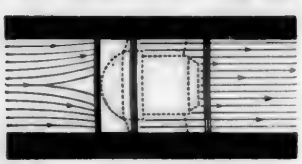
PLANNED SAVINGS for you and your customer



with JOY AXIVANE FANS



SAVE POWER The unique vaneaxial design utilizes aerodynamic blades with close tip tolerance. Internal vanes recover the rotative energy of the air from the blades and convert that energy to velocity and pressure. Result: high performance at low cost.

SAVE SPACE In-line design permits installation right *in the duct.* The photograph above, at Minneapolis-Honeywell Company, illustrates this feature. The fan, which supplies air to two large floors, utilizes an area only 54" in diameter and 26½" long. Result: exceptional economy of space.

SAVE INSTALLATION COSTS In-the-duct mounting of Joy Axivane Fans is easily and quickly accomplished, and requires only the simplest supports. Result: reduced labor time and costs.

Thus, the remarkable efficiency of the Joy Axivane Fan design . . . in contrast with other air-moving machines . . . gives you great savings in power, space, and labor. . . . And remember, the bigger the job, the greater the margin of benefit you enjoy. For full details, write ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** In Canada: *Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*

Write for FREE Bulletin 55-40

WSW 15956-55

Consult a Joy Engineer

for VANEAXIAL FANS • COMPRESSORS • OXYGEN GENERATORS
VACUUM PUMPS AND BOOSTERS

JOY

WORLD'S LARGEST MANUFACTURER OF VANEAXIAL-TYPE FANS

Voted Most Unpopular

. . WITH SCHOOL CHILDREN

H. B. SMITH BOILERS

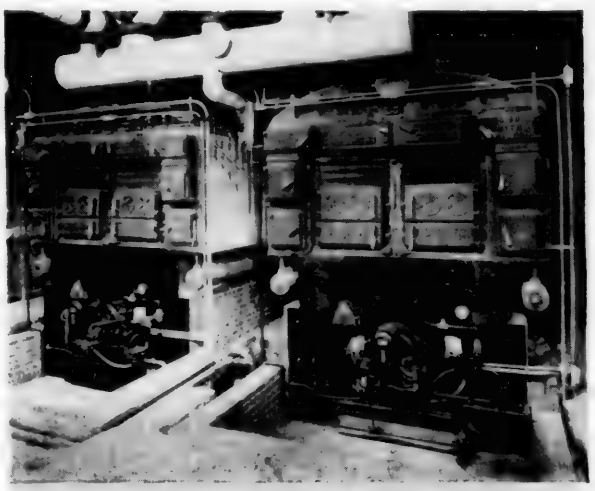
Well, you can hardly blame the youngsters — it's a long, long time between school closings due to failure of an H.B. Smith cast iron boiler. You see, these boilers are virtually breakdown-*proof*, due to their header-type construction . . .

But give the children a few more years: they'll be parents paying taxes to retire new bond issues for more classrooms for more children . . .

They'll vote "MOST POPULAR" when they learn that the H. B. Smith boilers, installed 20 years before, are still in first-class condition, and can be expanded with new cast iron boiler sections to carry the increased heat load . . . saving thousands of dollars.

. . . "MOST POPULAR" when they learn that there is no boiler tube replacement item in the maintenance budget, because H. B. Smith boilers have integral cast iron water tube sections which last as long as the boiler.

. . . "MOST POPULAR" as the years pass, because of fuel economy, quick heating, easy conversion, ability to take overloads — and, of course, *low maintenance and repair* . . .



Two 10-section oil-fired 60 Smith boilers installed in the Elementary School at Penn Wynn, Pa., in 1930, were enlarged to 26 sections each in 1949, and are serving the second generation . . . and there are more of them.

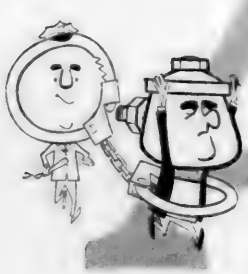
It's not unusual for an H.B. Smith cast iron boiler to serve three generations of children in a school.

If *you* want to be popular with taxpayers year after year, specify H. B. SMITH cast iron boilers for that school boiler plant.

H.B. Smith **CAST IRON BOILERS**

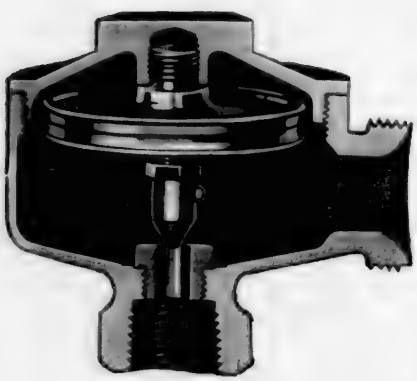
H. B. SMITH CO., INC., WESTFIELD, MASSACHUSETTS • *Established 1853*

Question: *Are your radiator traps stealing steam?*



Answer: *Yes! If you continue to use traps that are steam-wasting and ineffective. Better check them now!*

Discard your inefficient traps and install **illinois** Replacement Traps to get top radiator efficiency.



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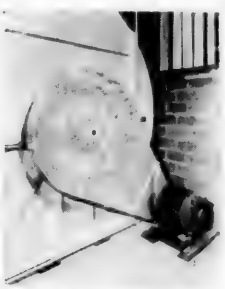

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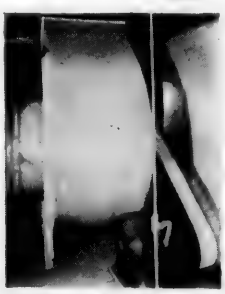

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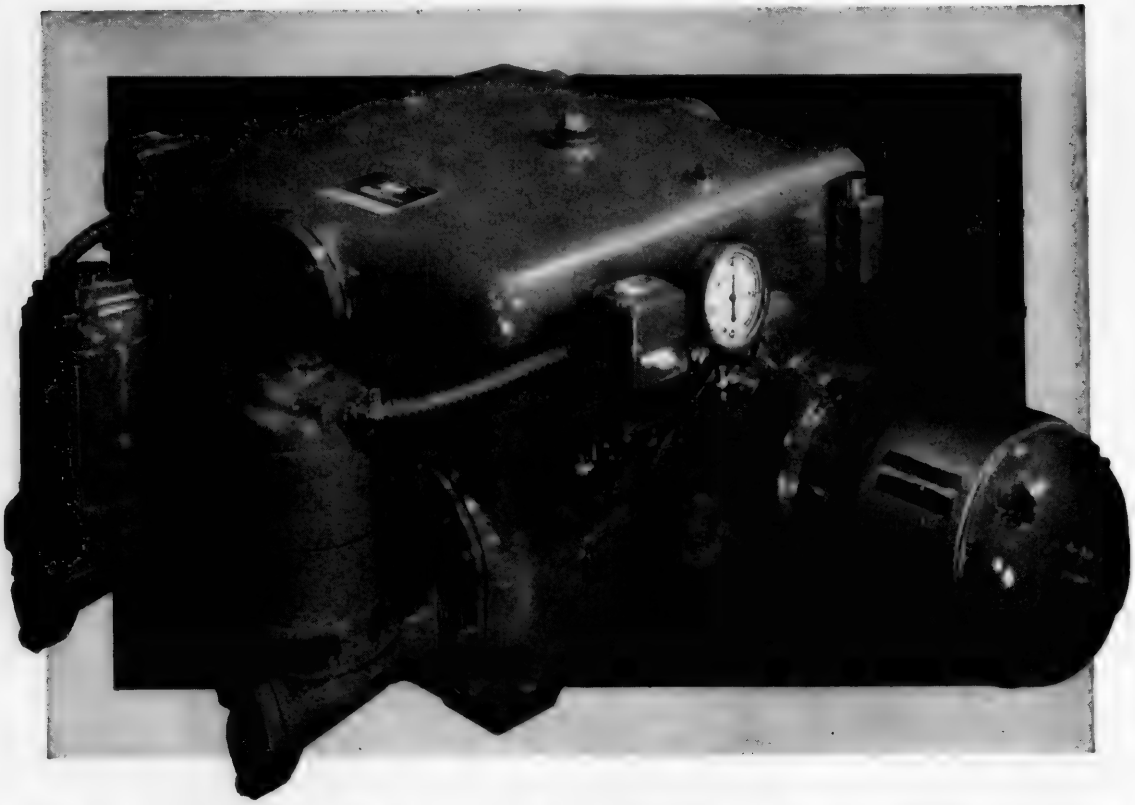

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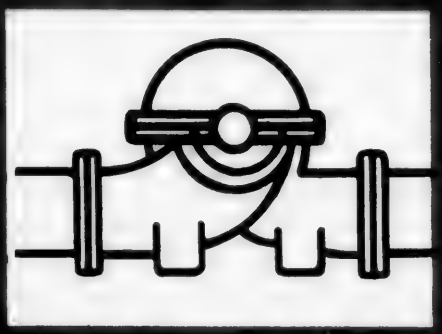


Centrifugal Pump Application

IGOR J. KARASSIK and ROY CARTER
Harrison Pump Division, Worthington Corporation, Harrison, N. J.

This is the first of five articles dealing with the application and selection criteria for centrifugal pumps. The authors will analyze those characteristics of centrifugal pumps which must be taken into account in various pumping situations. Capacities, heads, characteristic curves, rating curves, specific speed and other variables will be taken up in detail during the course of this new five-part series.

A CENTRIFUGAL pump is a reasonably flexible piece of machinery and any one pump can be applied to a fairly wide range of operating conditions. However, in order that the selection of the pump may result in the most economical solution of the problem, it is essential that a thorough knowledge be made available of all the factors which will effect the application. The capacity which it is desired to handle and the head against which the pump will have to operate are two of the most important of these factors.

While various specialized fields of application frequently use their own standard units of capacity—for instance, millions of gallons per day for municipal water supply, or barrels per day for oil field pipelines—pump manufacturers in the United States have adopted gallons per minute as the standard for pump ratings. Any other units of capacity can be readily converted into gpm and conversion equivalents are listed in most engineering data handbooks.

Because it is desirable that the maximum efficiency of the pump occur at or very near the normal capacity conditions, it is necessary that this normal capacity be specified and given at the normal pumping temperature. In addition, any variation in range of capacities, either desired or potentially accidental, should be stated.

This variation may easily become one of the most important factors in the selection of a centrifugal pump. For instance, if the desired variation is in excess of the rated capacity, such an increase may be circumvented by the fact that an increase in the capacity of a centrifugal pump operated at constant speed, is accompanied by a reduction of the total head which the pump develops. At the same time, if the pump operates, as is generally the case, in a system with a friction component, the required total head increases rapidly with an increase in capacity since the frictional losses also increase. Thus, the pump may be incapable of accommodating the desired capacity increase.

Another limitation to increased capacity operation may be introduced by the prevailing suction conditions unless the desired ultimate capacity is made known prior to the selection of the pump. Finally, if the power consumption increases with the capacity, as it does with the majority of centrifugal pump types, operation at capacities greater than anticipated, may overload the driver and interfere with the satisfactory functioning of the installed equipment.

Variations in capacity below the rated capacity may be equally impractical or uneconomical, unless foreseen prior to equipment selection. In certain cases, for instance, operation at very light flows may lead to an excessive temperature rise in the liquid handled through the inefficiency of the pump and the transformation of internal losses into heat energy. If such operation is known to occur, the pump can be prevented from running at flows below the danger point by providing a suitable minimum recirculation by-pass. In other cases, operation below certain loads may introduce unfavorable hydraulic reactions—such as excessive radial thrusts on the rotating element—which may shorten the useful life of the pump, or even cause premature failure. The most economical solution to the last problem is the installation of additional smaller units which would be operated to meet light load requirements. This solution is also applicable whenever operation at light loads presents no danger to the pump, but results in poor economy because of the reduced efficiency of the pump.

Heads and Head Factors

Pumping can be best defined as the addition of energy, kinetic and potential, to a liquid for the purpose of mov-

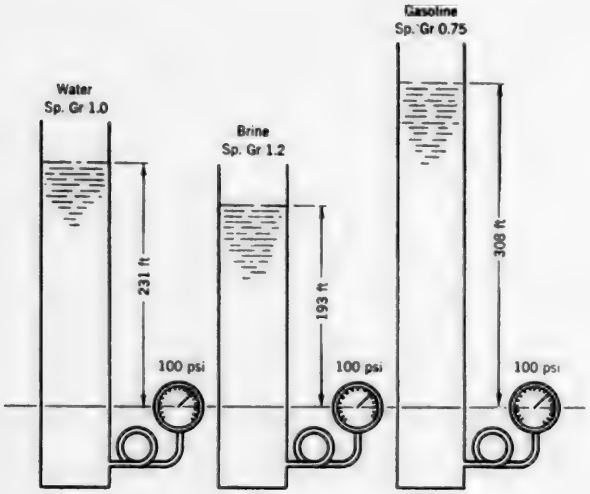


Fig. 1. Effects of liquid density on static head.

ing it from one point to another. A centrifugal pump transforms the input of mechanical energy to its rotating element into kinetic and potential energy delivered to the liquid being pumped. The centrifugal force developed by the impeller depends both upon its peripheral speed and upon the density of the liquid handled by the pump. On the other hand, the energy imparted by the pump to the liquid per pound of liquid is independent of the fluid itself (except for some variations introduced by viscosity variations, which need not be discussed here). Therefore a given centrifugal pump, operating at a given speed and handling a given volume of liquid, will transfer to the liquid the same foot-pounds of energy per pound regardless of the density of the liquid.

This energy, expressed in foot-pounds per pound or feet of liquid is the head developed by the pump, and we may therefore repeat that a given centrifugal pump when operated at a given speed will develop the same head in feet of the liquid handled at any specific capacity regardless of whether the liquid be water, brine, gasoline or mercury.

Conversion of Pressures

Just as in the case of capacities, heads may be expressed or measured in a number of different units such as feet of liquid, pounds per square inch, inches of mercury, etc. These units should always be converted into feet of the liquid handled. The most commonly encountered problem is the conversion of pounds per square inch into feet of liquid. A column of cold water with a specific gravity of 1.0 and 2.31 feet in height will produce a pressure of one pound per square inch at its base. Therefore, if the liquid handled is water at ordinary temperature, a pressure in pounds per square inch (or psi) can be converted into an equivalent head in feet by multplying the pressure in psi by 2.31. An increase or decrease in specific gravity causes a change in the equivalent head inversely with the gravity. Thus,

$$\text{Head in feet} = \frac{\text{Pressure in psi} \times 2.31}{\text{Specific Gravity}}$$

In a similar manner, inches of mercury can be converted into feet of liquid by the following formula:

$$\text{Head in feet} = \frac{\text{Inches of mercury} \times 1.134}{\text{Specific Gravity}}$$

The effect of the specific gravity is extremely important and should never be overlooked in applying centrifugal pumps. This importance is illustrated by Fig. 1 which shows columns of cold water, brine and gasoline all exerting the same pressure of 100 psi at their base. A pump handling water with specific gravity of 1.00 and intended to develop a pressure of 100 psi, must be designed for 231 feet of head. If the desired pressure is still 100 psi, but the liquid is brine, with a specific gravity of 1.2, the required head is reduced to 193 feet. If, on the other hand, the liquid is gasoline with a specific gravity of 0.75, the same 100 psi is equivalent to a head of 308 feet.

Gage and Absolute Pressures

Pressures and their equivalent heads can be expressed either in gage or in absolute units and should be so specified, as for instance: 50 psig or 65 psi absolute. If a pressure is given with relation to the atmospheric pressure, it is a gage reading. Absolute pressures, on the other hand, are the sum of the gage pressure and of the prevailing atmospheric pressure.

While generally it is most practical to work out an application problem in terms of gage pressures, complex problems can be simplified by working entirely in terms of absolute pressures. This is frequently the case when altitudes appreciably above sea level are involved. It should be noted that for every 1000 feet elevation above sea level, there is a decrease of approximately 1 inch of mercury in atmospheric pressure. This decrease affects specifically the suitability of suction conditions, as will be seen in greater detail later. For instance, if a pump is selected to work at an elevation of 4000 feet above sea level, where the atmospheric pressure is reduced by 4 inches of mercury (about 4.5 feet of cold water), the pump can handle a given capacity only if the suction lift is 4.5 feet less than the maximum permissible suction lift for this capacity at sea level.

Vapor Pressure

The vapor pressure of a liquid at any given temperature is that pressure at which the liquid will flash into

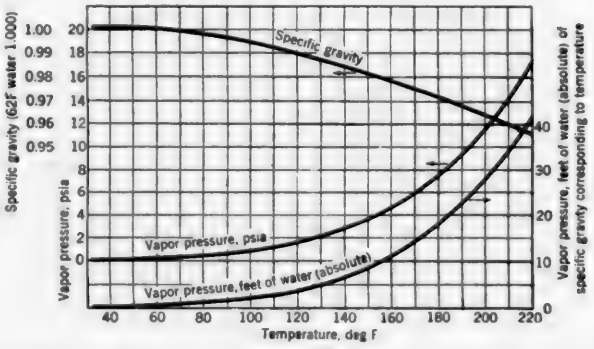


Fig. 2. Relations between specific gravity, vapor pressure and temperature for water.

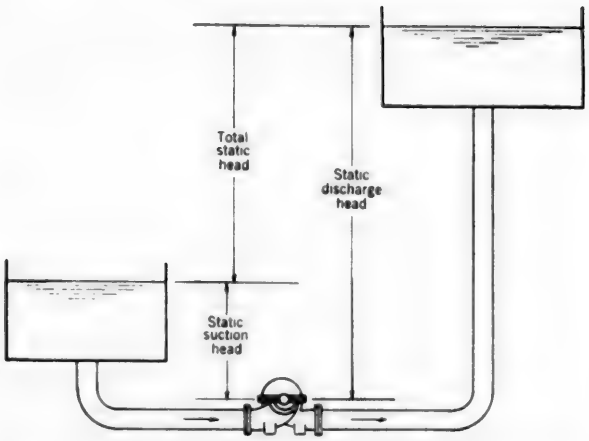


Fig. 3. Static heads in a system where both suction and discharge liquid levels are under atmospheric pressure with pump located below both liquid levels.

vapor if heat is added to it or, conversely, at which vapor at the given temperature will condense into liquid if heat is subtracted. Therefore, in handling liquids, it is necessary that the pressure at any point in the system never be permitted to fall below the vapor pressure at the pumping temperature.

Homogeneous liquids, such as water, have a definite vapor pressure for any given temperature and information on the relationship between these two is readily available in standard reference books. Mixed liquids, such as gasoline, however, are subject to partial vaporization since each component has its own vapor pressure-temperature relationship. If the liquid is not commonly encountered in the application of centrifugal pumps, it is wise to submit to the manufacturer all the necessary data on its vapor pressure.

Because vapor pressures are generally given in psi, great care should be given to changes in specific gravity with temperature when converting to heads in feet. As an example, the vapor pressure of water at 212 deg F is 14.7 psia. The equivalent head, expressed in feet of cold water is 14.7 x 2.31, or 33.9 ft. However, since the head should be expressed in feet of the liquid *at the pumping temperature*, the equivalent head of 212 deg water is 33.9 ÷ 0.959 = 35.4 ft of 212 deg water, where 0.959 is the specific gravity of water at 212 deg as in Fig. 2.

Head Terms

While in its elementary form the concept of head represents a static distance between the surface of a body of liquid and some arbitrarily chosen datum line and, as such, represents stored or potential energy, we must remember that energy can likewise exist as a pressure or in a kinetic form, as velocity head. Finally, in any dynamic system where liquids move from one point to another, this motion is accompanied by a dissipation of energy in the form of frictional losses, or friction head and of entrance and exit head losses—which are a form of friction losses if one wishes to so consider them. Thus, the total head of a system against which a pump must operate is made up of five components: (1) Static head, (2) difference in pressure between the source of supply and the ultimate delivery point, (3) velocity head, (4) friction head, (5) entrance and exit head losses.

Static Head

Since a static head is a difference in elevation, the total static head of a system is the difference between the suction liquid level and the discharge liquid level. In all but a very few specialized cases, this difference is positive—i.e. the discharge level is located above the suction level. When considering the discharge and suction conditions separately, it is common practice to use the centerline of a horizontal pump as the datum reference line. Hence, the static discharge head is the difference in elevation between the discharge liquid level and the pump centerline. The static suction head is the difference in elevation between the suction liquid level and the pump centerline. When the suction supply level is above the pump centerline, this difference in elevation is commonly called submergence rather than static suction head.

If the suction liquid level is below the pump centerline, the static suction head becomes negative and is generally spoken of as a static suction lift.

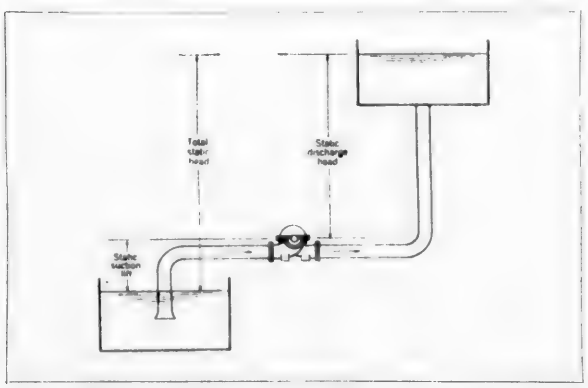


Fig. 4. Static heads in a system where both suction and discharge liquid levels are under atmospheric pressure with pump located above suction liquid level resulting in a static suction lift.

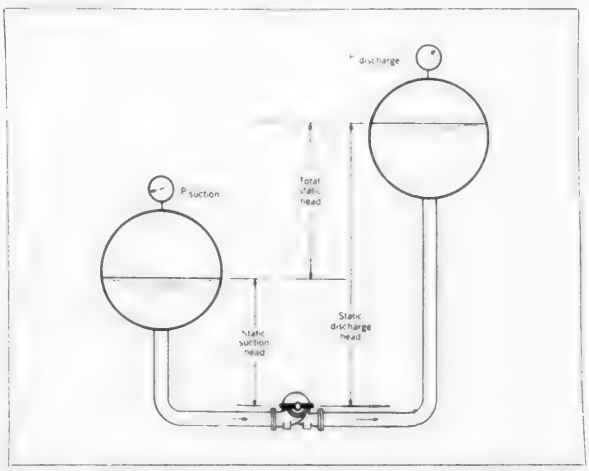


Fig. 5. System with suction and discharge liquid levels under pressures other than atmospheric.

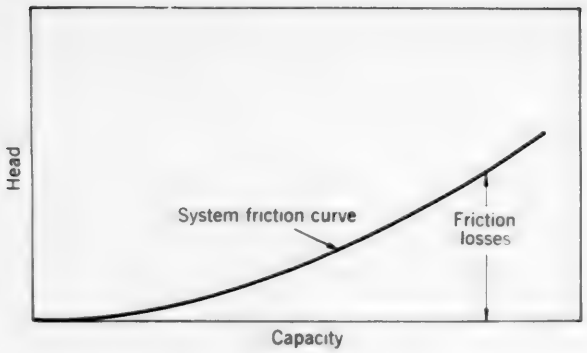


Fig. 6. System friction curve.

These terms are illustrated on Fig. 3, 4 and 5. In Fig. 5, both the pump suction and discharge are under pressures other than atmospheric. Whether differences in pressure should be considered as part of the total static head or separately is really immaterial. The latter method is preferred by the authors as it gives a clearer picture of the pumping system.

Velocity Head

Velocity head is the kinetic energy in a flowing liquid, expressed in foot-pounds per pound of liquid or, in other words, in feet of the liquid in question. It can be calculated from the relation

$$h_v = \frac{V^2}{2g}$$

where h_v = velocity head in feet
V = liquid velocity in feet per second
g = acceleration of gravity, or 32.2 ft per sec.^{2} at sea level.

Since the total energy of a flowing liquid is the sum of its pressure energy and kinetic energy and since a pressure gage gives an indication of only the pressure energy at that point, the velocity head must be added to the pressure gage reading in order to determine the actual suction head or discharge head.

If the suction and discharge pressures of a centrifugal pump are taken at points where the velocities are the same, the velocity head components of suction and discharge head cancel out and the total head can be determined by subtracting the suction gage reading from the discharge gage reading.

Whether or not the velocity head can be ignored for any given installation depends on its magnitude relative to the total head and on the accuracy of the pressure readings which can be made. Obviously, when the total heads are low—say in the order of 50 or 100 ft, the difference in velocity heads between the suction and discharge may be quite appreciable. In high head pumps, however, this difference may be less than 0.5% and thus less than the accuracy of the pressure readings.

Friction Head

Friction head is the energy required to overcome the friction losses of the liquid flowing through the piping, valves and fittings of the pumping system and it is expressed in feet of the liquid pumped. The friction head obviously varies with the quantity of flow, the size, type and internal surface finish of the piping and fittings and with the character of liquid itself, i.e. its density and viscosity.

Entrance and Exit Losses

Except for so-called booster pump installations, where the suction supply comes from a main under pressure, a centrifugal pump takes its suction supply from a reservoir, a tank or some form of inlet chamber. The end of the suction pipe is called the entrance, whether it projects into the source of supply or ends flush with a wall of the reservoir. The frictional loss at that point is called the entrance loss and is a function of the design of the pipe entrance. A well rounded bell-mouth results in the lowest possible entrance loss.

Similarly, the point where the discharge piping terminates either immersed in a body of liquid or just in open air is called the exit. In most cases, this exit is of the same size as the discharge piping with the result that the entire velocity head is lost. If the end of this discharge piping is tapered and flared out, the velocity is reduced and a good portion of the velocity head is recovered.

One of the advantages of considering the entrance and exit loses separately from the friction losses is that it can be readily seen whether these losses are excessive and whether it may be advisable to so revise the layout as to reduce these losses to a more reasonable value.

System Friction and System Head Curves

A system friction curve is the graphical presentation of the relation between the capacity and the total friction head losses of a system. These head losses vary approximately as the square of the capacity and the curve (see Fig. 6) has a typical parabolic shape.

A curve combining the friction head losses and of all the static heads and pressure differences of a system is called a system head curve. (See Fig. 7). In the event that either the static heads or pressure differences of a system vary at times, it is advisable to construct system head curves for both the minimum and the maximum static heads and/or pressure differences.

A centrifugal pump will deliver that capacity into a

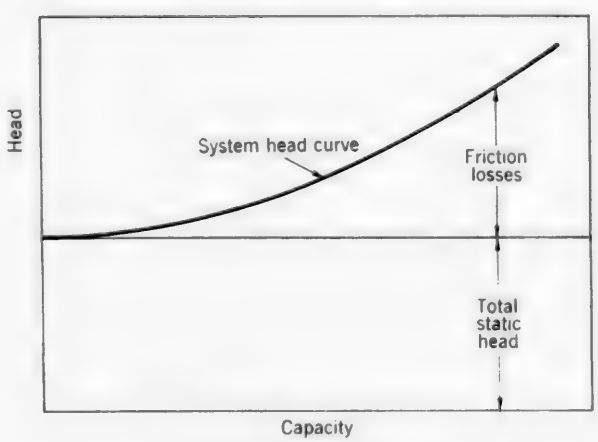


Fig. 7. System head curve.

system in which it is operating at which the head required by the system equals exactly the head produced by the pump. As a result, in order to predict the capacity which a pump will deliver through a system, all that is necessary is to superimpose the system-head curves constructed with maximum and minimum static and pressure differentials on the pump head-capacity curve.

It should be remembered that pipe roughness and friction losses increase with age. It is therefore the practice to base the friction losses on data for 10- or 15-year old pipe which are, of course, higher than friction losses of new pipe. As a result, the actual system head curve is somewhat lower in a new system and the pump will deliver somewhat more capacity. If motor size selections or suction conditions are marginal, it is essential to check the intersection of the pump head-capacity curve with the system-head curves for both new and old pipe.

In subsequent issues, the authors will offer application data and define pump heads for suction and discharge conditions, total head, characteristic curves, and rating curves.

Moisture Control Needed in Printing

There are about as many techniques in the printing business as there are printers, but on one thing they all agree —that one of the critical problems in quality production is the precise regulation of moisture in the paper stock.

Rust Craft Publishers of Dedham, Mass., printers of more than 300 million high quality greeting cards each year, had lived with this perplexing and expensive moisture control situation for more than 50 years. When it was decided in 1953 to build a new plant, the building was designed to overcome the moisture control problem.

Moisture control is specially critical in production of greeting cards, on which as many as six colors are used in precise registration. Even the slightest variation in paper size, caused by a change of moisture content in the stock, can result in mis-registration of colors. When this happens it means the loss of the entire press run of expensive stock, the loss of skilled man hours and costly downtime of high speed presses.

Rust Craft, in its new one- and two-story plant of colonial design, has more than 8½ acres under roof, with one-third of the plant occupied by paper storage, paper and film processing departments. It is in these departments where moisture variations can and do play havoc with operations, and where air conditioning equipment must operate at peak efficiency—a consistent 76 degrees and 45% humidity.

More than 113,000 square feet of Pittsburgh Corning's Foamglas, insulating cellular glass, two inches thick, were installed in the roof area covering these critical departments. In addition, another 37,000 square feet of the cellular glass material was used in the exterior wall of the film processing department where original art is reduced to its film counterparts and where rigid dimensional controls must be maintained for precise color registration. As Rust Craft's printing is done almost entirely by the off-set process, based upon the resistance of water to an oil base ink, an insulation that would resist moisture penetration and retain its insulating ability was required.

Essentially what happens when paper absorbs or loses its moisture content, is that the intricately woven fibers that make up the paper swell or decrease in size. Because of the thousands of tiny fibers in each sheet of stock, even a minute expansion or contraction of the fibers can cause a disturbing overall change in sheet dimensions.

Fred W. Rust, Jr., of Rust Craft Publishers, greeting card specialists, shown in the printing department of the company's new plant at Dedham, Mass., says the critical problem in quality production of greeting cards is the precise control of moisture in the paper stock.

In Rust Craft's new plant this condition has been obviated by installation of conditioning machines in which the paper is hung before use and humidified to plant conditions by circulation of plant air across each sheet.

This treatment of stock is the first step in paper handling, and only after this has been done is the stock sent to the cutting department. Because the Foamglas helps insure even and comparable atmospheric condition throughout the entire paper handling area, the paper can be entered into process without fear of any dimensional change.—Fred W. Rust, Jr., Rust Craft Publishers.

Multiple Heat Pump Installations

GERALD L. BIEHN

Design Engineer, Air Conditioning Division, Westinghouse Electric Corp., Staunton, Va.

Several buildings are covered to show how multiple heat pumps may be used in a single application. Features of these designs are described plus installation pointers.

SLOWLY, but steadily, the heat pump has been taking its place as an accepted member of the air conditioning product line. In a few short years it has been transformed from an unknown quantity in the trial or test stage to a recognized and very desirable type of year-round air conditioning unit. Although the sales figures for 1955 may not quite equal those predicted by some of the early enthusiasts, the record to date is such that even the heat pump's strongest critics must admit that it has made an impact on today's thinking and today's market.

Fig. 1. Combination bank and office building, Kingsport, Tenn. Courtesy, Johnson-Hilliard, Inc.

As anticipated, heat pumps have made considerable inroads into the small commercial and residential markets. Invasion into the realm of speculative building projects has accounted for a sizable volume of the total activity, although this represents only a start in this extremely fertile field. One of the finest assists toward increased sales in recent months, however, has come in the form of multiple installations. So great is the potential of this type of application that the true scope is still difficult to define.

Multiple Installation

What constitutes a multiple heat pump installation? Technically, anytime two or more units are installed on a single application, such as in a store or larger home, the application fits into this category. Generally, though, the term refers to the installation that requires sufficiently large tonnage to necessitate, according to earlier standards, a central or field assembled system. This type of application would include small factories, stores, commercial buildings, warehouses and professional buildings. The use of package heat pumps in two digit quantities on a single installation is not uncommon. It is difficult to realize that systems of this type are now operating successfully in places where they would not have been considered barely a year ago.

What has brought about this change? How did units that seemed destined for use only in residences and small commercial applications find their way into the larger commercial field? The change may be attributed to simplicity and flexibility.

Complexities of specialized engineering, of controls and piping and of coordination of the various trades involved make it difficult for the field assembled system to compete with the compact and complete factory package which requires only ductwork, wiring and a condensate drain. Besides, most of this work can be done either before or after the actual placing of the units. Included with this labor simplification is a corresponding economy in the space requirements of the package unit.

System flexibility possibilities obtained through multiple units are too numerous to list. However, there are several basic arrangements to point out, although each of these is subject to qualification with regard to details. These may be classified in two main groups—those located within the building to be conditioned, and those located externally. Each of these can be subdivided with

Fig. 2. Multiple units provide zone flexibility and simple electrical installation, piping and duct connections. Courtesy, Johnson-Hilliard, Inc.

Fig. 3. Service center, Public Service Company of Oklahoma at Tulsa. Units are located in a penthouse. Courtesy, Public Service Co. of Oklahoma.

regard to arrangement, that is positioned individually or in groups.

Typical of the first of these arrangements, the indoor group, are two installations in Kingsport, Tenn., designed by Kingsport Utilities, Inc. Although they fall in the same general classification, the differences between them emphasize the versatility of the multiple unit installation. The Cassell Building, a single story combination bank and office building, (Fig. 1), is conditioned by four Westinghouse 5 hp heat pumps in two equipment rooms. Since the bank is isolated from the rest of the building. the unit serving it has its own small equipment room within the area, and thus its duct arrangement is quite standard. The other three units are in a large common equipment room and have several interesting features.

On the indoor air discharge side, each unit is connected to supply a specific group of offices, but the return for all units is common and the equipment room itself is used as a return plenum. The outdoor sections are connected to supply and return ducts which are common to all of the units. Gravity air dampers provided on the outlet of each unit prevent leakage between these two ducts through units not in operation. This duct arrangement is particularly advantageous where a minimum of wall space is to be used. Another interesting treatment was also given to the outdoor air openings in the wall. Instead of using a louvered grill, the intake and discharge are provided by open spaced bricks. This design blends with the building construction and thus adds rather than detracts from the appearance.

Insurance Building Installation

The second of these installations is a two-story insurance company building, Bennett & Edwards, Inc. which has six 5 hp units installed in the first floor equipment room and two 5 hp and two 3 hp units in the second floor equipment room. Eight of the nine units are standing along the outside walls so that outdoor air ducts are merely stubbed through. One unit is centered in each equipment room and takes in and discharges air through the roof. Figure 2 illustrates clearly the relative simplicity of electrical, piping and duct connections as well as the zoning flexibility that multiple units provide.

Actually the unit located in the bank previously described is individual rather than part of the group, but the individual arrangement, as previously defined, is normally applied more to large open areas such as factories or stores. Here units can be spaced along the wall to match varying load requirements. Elaborate supply and return systems can be eliminated for only short supply and no return ducts are necessary. Since the units are near or against an outside wall, a minimum of outdoor ductwork is needed. Individual services can be supplied from mains under the floor or along the walls. No central equipment room is required but rather each unit utilizes only a small floor area in the section it conditions, thus eliminating any wasted space. All of these combine for greater simplification.

External Installation

An excellent example of the second of these main classifications, the external group arrangement, is the installation at the Service Center of the Public Service Company of Oklahoma at Tulsa. This installation is shown in Figs. 3 and 4. By locating the units outside the building, the usable area inside which is normally lost to the equipment can be recovered. This can prove to be a desirable as well as an economical arrangement. Units may be placed either next to the building itself or located on the roof as is the case here. Obviously units installed in this manner need not detract from the appearance of the building.

Fig. 4. Units placed on roof of Public Service Company of Oklahoma building.

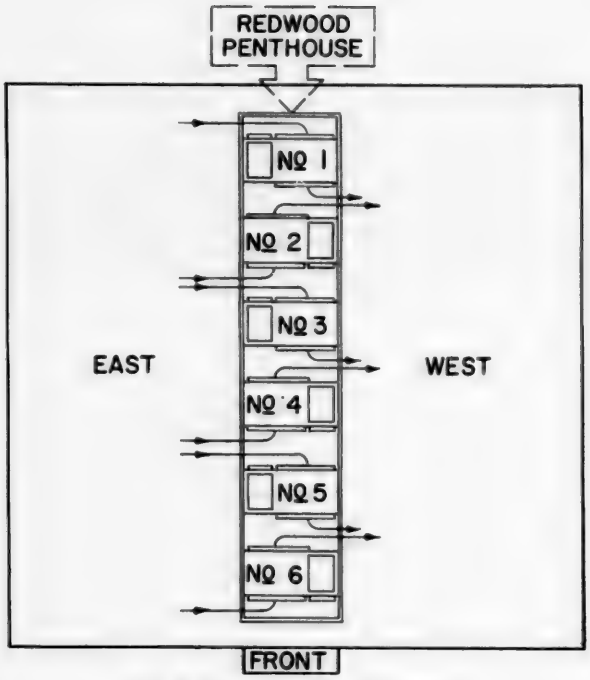


Fig. 5. Detail of outdoor air pattern.

Heating and cooling at the Center are completely handled by six 5 hp heat pumps which are semi-protected from the weather by being enclosed in a redwood penthouse. The penthouse also serves to improve the building roof-line and silhouette. Penthouse doors provide complete access to each unit for maintenance of the equipment. Condensate water is drained to the roof top.

A detail of the outdoor air pattern is indicated in Fig. 5. The units, although back to back, have been arranged so the outlets are never directly opposed. All the air is taken in from the east and discharged to the west. Local prevailing winds not only made this desirable, but also help the heat pump efficiency. Care of this type in planning a heat pump installation should never be neglected.

Individual units placed outdoors could also be placed on the roof or set on slabs along the wall in a manner similar to that described for the indoor individual units. This type of arrangement normally eliminates the need for outdoor air ducts because air may be taken in on one side of the unit and exhausted on the other. This completely eliminates the possibility of recirculation. If, however, some shelter is not provided, extra care must be taken when installing the units to provide weatherproofing. Additional insulation and sealed indoor circuits will also be required. Of course, this applies to roof-mounted units as well.

Experience has shown that a majority of the installations are utilizing the group arrangement. This may indicate a trend or it may merely indicate that grouping was more adaptable to the particular applications encountered to date. In either case, the latter arrangement also offers many possibilities and only time will provide comparative figures which will be indicative of the true relative usefulness of the two. For the present, these details are of secondary interest only. Of primary importance is the over-all potential of this latest avenue of heat pump growth—the multiple unit installation.

Air Conditioning Improves Powder Puff Manufacture

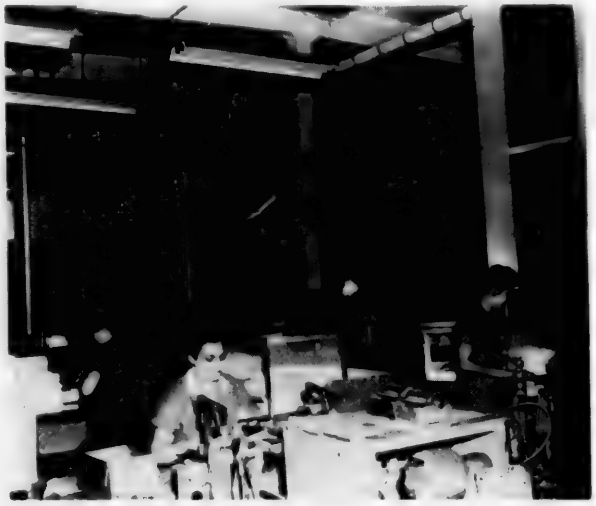
Modern automation, aided by air conditioning, has now been applied to the manufacture of a most widely-used product by women, the powder puff.

At the Glendale, N. Y. plant of Victoria Vogue, Inc., one of the country's leading manufacturers of powder puffs, a series of special automation machines designed and developed exclusively for the company are now being used. They are employed to weave, convert and process cloth into powder puffs which are sold nationally to leading chains, department stores and cosmetic trade outlets in general.

The intricate machines, many parts of which are extremely susceptible to temperature change or high humidity, are protected by a modern air conditioning system installed earlier this year. Because of the temperature and humidity control provided by the system, which consists of seven Airtemp 8-ton water-cooled packaged air conditioners, the firm reports that no major breakdown involving the special production machines, was encountered during the past summer.

In addition to equipment protection, the air conditioning system also provides maximum working comfort for employees, the majority of whom are women. One packaged unit is equipped with a special clock damper, which directs conditioned air to the company's cafeteria during lunch hour and at the end of the day to an area where uniforms are changed.

One result of the combination of humidity and dust control has been that far less material has had to be rejected by the inspection department because such material was soiled during processing or handling. Similarly, air conditioning has reduced the amount of time previously devoted to machinery and plant maintenance.


Air conditioning improves powder puff production.

Dust Control for School Woodworking Shops

JAMES R. KAYSE

Supervising Engineer, Dust Control Products
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With school authorities becoming more cognizant of the benefits of dust control systems, the use of dust collectors in school woodworking shops is rapidly increasing. Dust collector installations are providing savings in housekeeping cost with a cleaner and more pleasant atmosphere.

EIGHT states now require dust control from industrial woodworking operations regardless of the intensity of operations involved. Schools should profit from this long established safety procedure and provide for their dust producing Vocational Arts operation. In addition to housekeeping and air pollution problems involved, the National Safety Council lists the lack of adequate dust control as a major cause of accidents because visibility is poor and operators are less alert.

A well engineered exhaust system is required for the realization of these benefits. Since school woodworking shops are equipped with tools similar to those used in industrial woodworking operations, the same type of

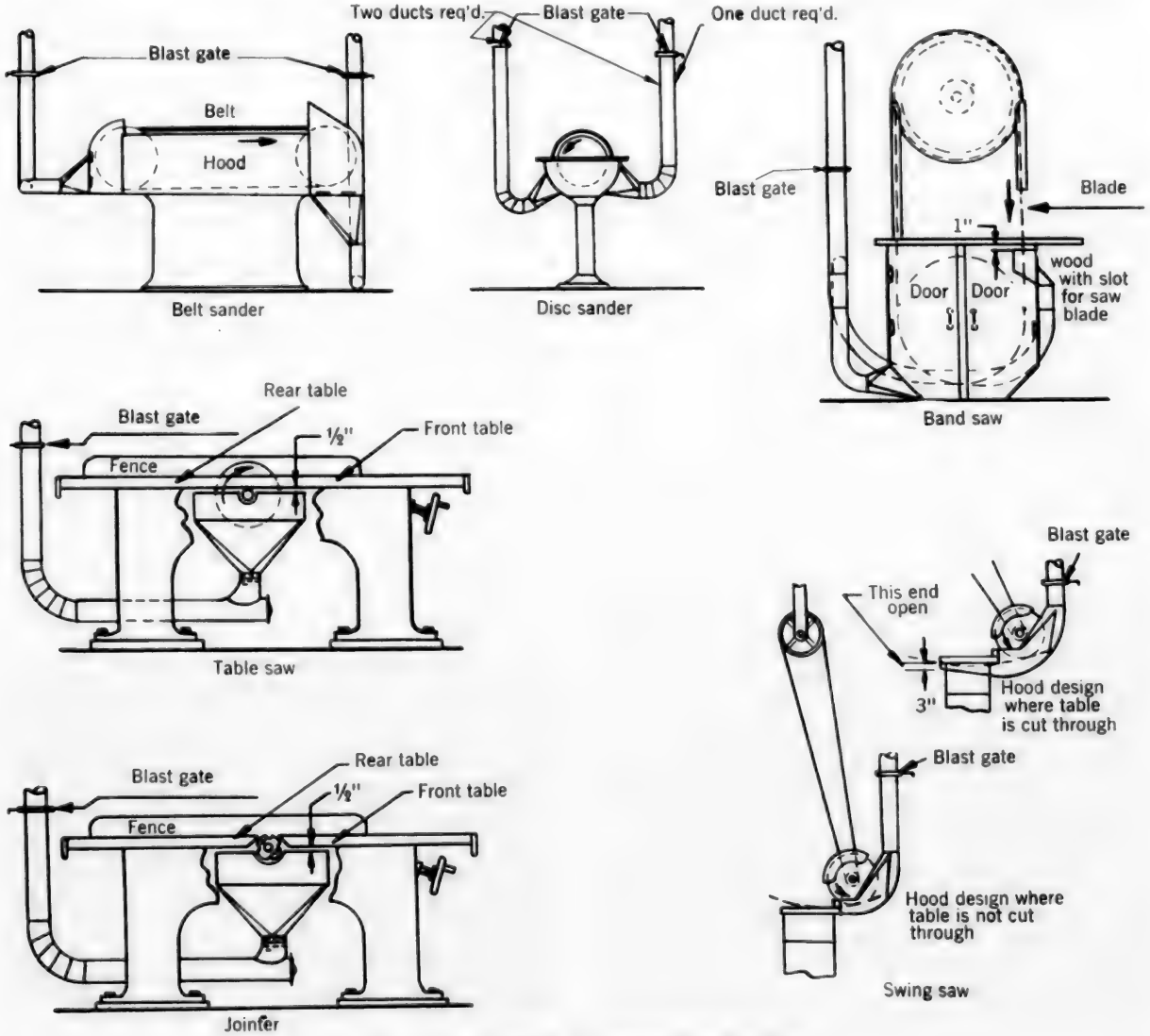
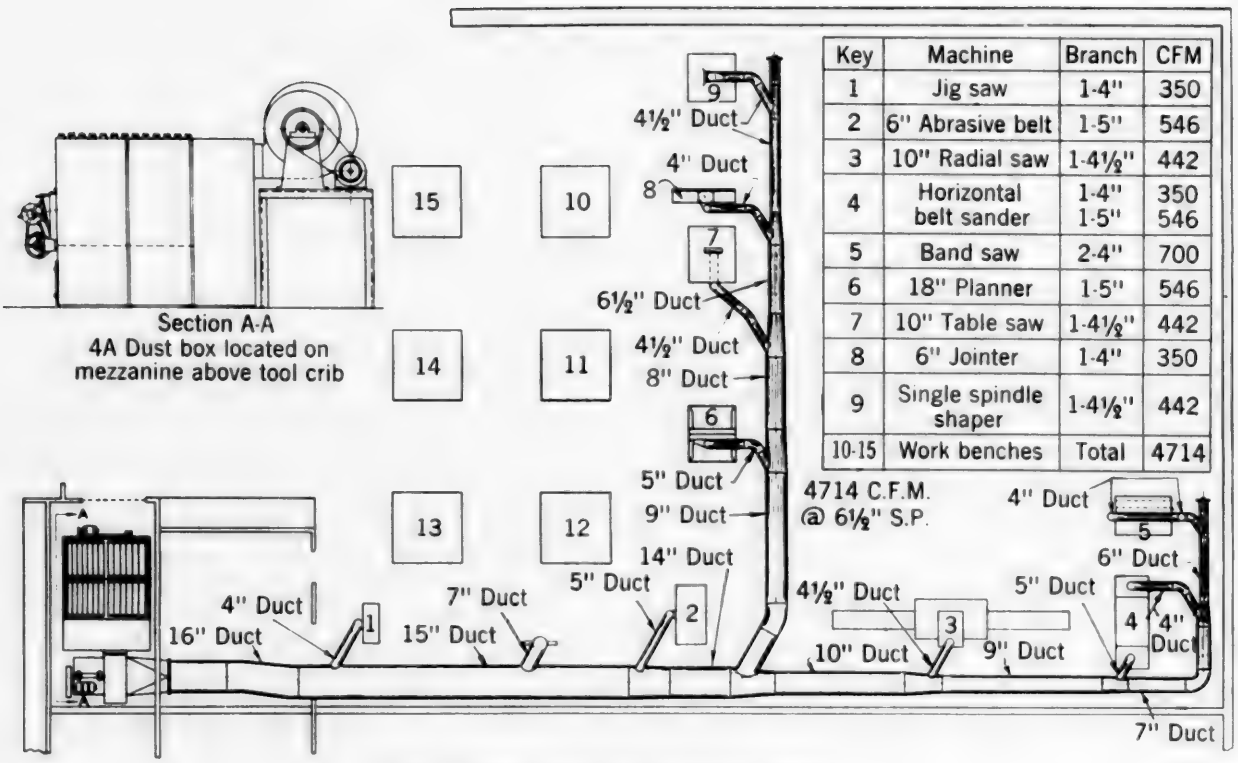


Fig. 1. Hood designs for woodworking machines.



Key	Machine	Branch	CFM
1	Jig saw	1-4"	350
2	6" Abrasive belt	1-5"	546
3	10" Radial saw	1-4½"	442
4	Horizontal belt sander	1-4" 1-5"	350 546
5	Band saw	2-4"	700
6	18" Planner	1-5"	546
7	10" Table saw	1-4½"	442
8	6" Jointer	1-4"	350
9	Single spindle shaper	1-4½"	442
10-15	Work benches	Total	4714

Fig. 2. Typical school shop installation diagram.

exhaust system should be designed. As a result of many years experience, the exhaust ventilation requirements, Table 1, and hood designs, Fig. 1, have become standardized to a considerable extend among ventilating engineers and should serve as an excellent guide.

All exhaust systems are basically similar in that they are composed of hoods at the dust producing points connected by branch ducts to a common main duct which is connected to a fan or duct collector. The volume of air drawn through each hood must be sufficient to capture all of the dust produced. The velocity of the air in the ducts must be high enough to convey the entrained dust particles to the dust collector. The branch and main ducts must be sized proportionately to maintain proper distribution of air through the hoods. Blast gates are used to provide final adjustment of the system. The dust collector must be properly selected to guarantee that the operating volume will be sufficient. A typical installation is shown in Fig. 2 and the required air volumes for the different equipment are listed. A photograph of this installation is shown in Fig. 3. Note the location of the dust collector on the balcony above the shop instructor's office and tool crib.

Some dust collectors are designed to permit discharging the cleaned air to the atmosphere and others to recirculate it to the classroom. In the former case, the collector may be located outside the building to conserve floor space (Fig. 4) or placed in the building for ease of cleaning and servicing. One location frequently used is near the boiler room, if a coal fired boiler is used, since the collected dust can be burned in the boiler with simple precautions for easy disposal.

The amount of dust collected will vary with the number and types of machines and this determines the time interval required for cleaning. This interval is also a function of the storage space provided in the collector.

The exhaust ducts can be located along the ceiling (Fig. 5) or beneath the floor (Fig. 6). The latter will normally be used only in new schools since it is usually too expensive to install the ducts beneath the floor in existing schools. Both methods have their advantages as noted in the following:

Ceiling	*Floor*
Permits relocation of equipment	Appearance
Allows changes in air volume requirements	Does not obscure visibility around machines
Easier to balance air flow	Will not interfere with light fixtures, eliminating shadows
Duct maintenance easier	Shorter length of duct

Fig. 3. School shop shown in Fig. 2.

TABLE 1—EXHAUST REQUIREMENTS FOR TYPICAL WOODWORKING EQUIPMENT

Machine	Branch Size, inches	Air Volume, cfm
Circular Saw		
Up to 12-inch dia.	1—4	350
Over 12-inch dia.	1—5	550
Swing Saw		
Up to 20-inch dia.	1—4	350
Over 20-inch dia.	1—4½	450
Disc. Sander		
Up to 12-inch dia.	1—4	350
12 to 18-inch dia.	1—4½	450
18 to 26-inch dia.	1—5	550
26 to 32-inch dia.	2—4	700
Jointers		
Up to 6-inch knives	1—4	350
6 to 12-inch knives	1—5	550
12 to 20-inch knives	1—6	775
Over 20-inch knives	1—7	1050
Planers or Surfacers		
Up to 20-inch max. working width	1—6	775
20 to 26-inch max. working width	1—7	1050
26 to 32-inch max. working width	1—8	1450
32 to 38-inch max. working width	1—9	1800
Over 38-inch max. working width	1—10	2200
Vertical Belt Sanders (rear belt and both pulleys enclosed)		
Up to 6 inches wide	4½ on bottom	450
6 to 9 inches wide	5 on bottom	550
9 to 14 inches wide	6 on bottom	775
Over 14 inches wide	7 on bottom	1050
Tenoner (not usually exhausted)	1—4	350
Lathe (not usually exhausted)	1—4½	450
Scroll Saw (not usually exhausted)	1—4	350

Band Saws and Resaws	Bottom	Top	Bottom	Top
Up to 2 inches wide	1—4	1—4	350	350
2 to 3 inches wide	1—5	1—4	550	350
3 to 4 inches wide	1—6	1—5	775	550
4 to 5 inches wide	1—7	1—5	1050	550
Over 5 inches wide	1—8	1—5	1450	550

Horizontal Belt Sander	Drive Pulley	Idler Pulley	Drive Pulley	Idler Pulley
Up to 6 inches wide	1—4½	1—4	450	350
6 to 9 inches wide	1—5	1—4	550	350
9 to 14 inches wide	1—6	1—4	775	350
Over 14 inches wide	1—7	1—5	1050	550

Shapers
One 4½ to 6-inch branch, 450 to 775 cfm for each spindle according to size and character of work.

Floor Sweeps
Use 6-inch branch for fine dust to 8-inch branch for coarse material. Mouth at floor, 10 x 4 to 12 x 5 inches.
Area of floor sweep pipe need not be included in computing main dust area.

Machine Characteristics

Sanders: These machines create the finest dust particles released in any woodworking operation, and effective hooding is essential to prevent the dispersion of fine dust throughout the classroom. The horizontal belt sander requires a hood at the head pulley and frequently a companion hood for the idler pulley. The hood should be designed to concentrate the exhaust volume at the top of the belt toward which the sander dust is thrown by the direction of belt travel and at the bottom of the belt to give a scouring action to prevent carryover due to air currents setup by the belt movement. Disc sanders are usually provided with exhaust take-off points by the manufacturer. In some cases, these outlets do not have sufficient area and it is necessary to enlarge them to meet the requirements in Table 1. Suggested hood designs for both belt sanders and disc sanders are shown in Fig. 1 and a typical installation for both machines in Fig. 5.

Fig. 4. Dust collector located outside.

Saws: While hooding of conventional circular table saws, swing saws, and band saws is commonplace, some special operations may require variation to standard hood design. Circular table saws require a hood beneath the table with a slot of not less than ½ inch between the top of the hood and the bottom of the table bed. Band saws usually require two exhaust points, one beneath the bed at the point of cutting and the other at the bottom

Fig. 5. Installation with ceiling ducts.

Fig. 6. Installation with ducts beneath floor.

pulley to capture any dust traveling with the band. Hoods for swing saws are usually designed in one of two manners depending on whether or not a slot is used in the table bed. Typical hoods for all three types of saws are illustrated in Fig. 1. A circular table saw installation is shown in Fig. 3 and a band saw in Fig. 5.

Planers: Planers produce a large quantity of dust and, consequently, will require more air than other woodworking equipment. Exhaust volumes are a function of the cutter width, with the hood located above the table. Typical hooding is shown in Fig. 3 and Fig. 5 with an 18-inch and 24-inch planer being exhausted with 550 and 1100 cfm respectively.

Jointers: Jointers are hooded in the same manner as circular table saws. The hood is located beneath the bed with the top of the hood being not less than ½ inch from the bottom of the table. Hood design is shown in Fig. 1 and typical installation in Fig. 5.

Shapers: Shapers require a 4½-inch to 6-inch branch exhausting 450 to 775 cfm for each spindle depending on the size of the spindle and type of work being done. Hood construction and method of support must permit movement to follow the path of the cutter head.

Floor sweeps: Floor sweeps can be installed to dispose of refuse that is swept from the working area. A 6-inch branch is usual for school woodworking with area of sweep being 10 by 4 inches. As floor sweeps are never used while the equipment is operating, it is not necessary to include the air volume when computing the design calculations. A typical floor sweep installation is shown in Fig. 5.

Exhaust volumes and transport velocity: Exhaust volumes will vary with length of cutter heads, length of sander drums, width of sander belts, and diameter of saws as shown in Table 1. In general, saws require 4-inch to 6-inch branches; cutting heads a 5-inch branch. Conveying velocities of 4000 fpm in branch ducts and 3500 rpm in main ducts will be ample if branch ducts are large enough to handle the necessary volume at the 4000 fpm rate.

Vocational Arts training is fulfilling a recognized need by encouraging interest in skilled trades. Use of dust control equipment helps maintain this interest by demonstrating the pleasant working conditions that exist in present day industrial plants.

Install Draftless Air Diffusers in New Ocean Liners

Something new in air distribution for sea going vessels will be installed aboard six luxury ships now being built by Grace Lines, Moore-McCormack and Oceanic steamship lines. Air diffusers manufactured by the Pyle-National Company, Chicago, manufacturer of air diffusing and electrical equipment, will be installed throughout the four ships of Oceanic and Moore-McCormack and in the public rooms of the Grace Lines' two ships.

The Moore-McCormack liners are being built by the New York Shipbuilding Corporation, the Grace Lines ships by Ingalls Shipbuilding Company (Pascagoula) and Oceanic Steamship's conversion job by Willamette Iron and Steel.

Diffusers employ a perforated ceiling panel to introduce air vertically and at low velocity into a room or working area. These perforations reduce the high velocity of the air traveling through the duct from 1,000 fpm to 40 or 50 fpm as it leaves the Multi-Vent diffuser, ideal for the confined spaces of passenger ships. Air conditioning engineers say a good analogy to this system is the principle of the sprinkling can. A perforated head or direct spout each deliver the same amount of water, but the flow from the perforated head is much more gentle and widespread.

In soliciting bids for the construction of the vessels the ship builders made the following specifications with regard to the air diffusers to be used:

"Perforated ceiling distribution shall be employed in passenger staterooms and public spaces.

"Great care shall be taken in the design of the systems and in the choice and location of terminals (diffusers) to avoid excessive noise or objectionable drafts in the habitable zone of the rooms."

The ship builders specified that there be no great temperature difference at the point where the air left the terminal or air diffuser. A minimum of 20 cubic feet of outside air per minute per person was specified to be supplied under all operating conditions.

"All terminals and grilles shall be designed for quiet operation, and shall be of an approved type and size suitable for the space involved. All terminals (air diffusers) except directional type shall be capable of properly ventilating the area without creating objectionable drafts."

All of these requirements were met by the selected air diffusers and they will be installed as construction of the ships proceeds. The diffuser makes possible draftless air conditioning even where a high number of air changes is required. The advantages apply equally as well to heating and ventilating systems.

In addition to being draftless, the air diffuser is completely concealed from view and permits freedom in movement of partitions or shelves. Partitions can be moved adjacent to or even bisecting a perforated outlet panel without disturbing effective air distribution.

AIR CONDITIONING, HEATING AND VENTILATING'S

Reference Section

Service Hot Water for Commercial and Industrial Use

FRED M. REITER

Fuel Engineer, The Dayton Power and Light Company, Dayton, Ohio

Data of value to the design engineer for planning service hot water systems for commercial and industrial applications.

AIR CONDITIONING, HEATING AND VENTILATING — FEBRUARY, 1956

Service Hot Water for Commercial and Industrial Use

FRED M. REITER

Fuel Engineer, The Dayton Power and Light Company, Dayton, Ohio

Presented for the design engineer are specific figures on the amount of service hot water required for dishwashers and other units in various types of restaurant kitchens, laundries, and for the many industrial and process applications which require large amounts of hot water. Factual data in this article are helpful for laying out such systems.

LARGE amounts of hot water are required for commercial applications such as restaurants and laundries, and for industrial use such as in the cleaning and treatment of metals or for rinses in textile operations. While a previous article (AIR CONDITIONING, HEATING AND VENTILATING, December, 1955, pp. 79-94) considered service hot water for apartments and similar multi-story buildings, this article is devoted to engineering information required in the design of service hot water systems for commercial and industrial operations.

HOTELS, RESTAURANTS, AND OFFICE BUILDINGS

Basic data on hot water consumptions of commercial establishments were derived by Apman (1)* and placed in four general categories. These are, essentially, hotels, restaurants, apartment houses and private homes, and office or loft buildings.

1. *Hotels and all-day restaurants.* For this group the hot water demand varied between about 20 and 70 gph. Heaviest demands occurred in two periods: 8 a.m. to 2 p.m. and 5 p.m. to midnight. The high load demand extends over 6 hours each period, a relatively long segment of the day. The ratio of the maximum hour to the 24-hour consumption is 1 to 15, normally. Based upon a 1,000 gal per day unit consumption, for a 20-hour operating day, in order to allow for a 20% excess capacity for the boiler or heater, if unreasonable demands occur at the same time, a comparatively small boiler or heater can be utilized. Basic formulas for hotels and all-day restaurants follow:

$$B = \frac{D}{20} = \frac{1{,}000 \text{ gallons per day}}{20 \text{ hours usage}}$$

50 gal per hour of operation

where B = boiler or heater size, in gallons per hour heating or recovery capacity
D = maximum 24-hour consumption in gallons

$$T = 6\left(\frac{D}{15} - B\right) =$$

$$6\left(\frac{1{,}000 \text{ gal per day}}{\text{ratio of } 15} - 50\right) = 100 \text{ gal storage capacity}$$

where T = storage tank capacity in gallons
6 = the 6 hours of use of full demand
15 = the ratio of maximum hour demand to 24-hour usage
50 = the capacity of the heat source in hourly hot water supply

2. *Two-meal restaurants (also apartment houses and private homes).* In this category the heavy demands are more intermittent. The ratio of maximum demand to the 24-hour consumption is 1 to 10 average, or 10% of the day's load. The duration of the maximum demand is 4 hours out of 24. Applying the formula on a base of 1000 gallons per day use:

$$B = \frac{D}{20} = \frac{1{,}000}{20} \text{ or } 50 \text{ gph hot water heater size}$$

$$T = 4\left(\frac{D}{10} - B\right) = 4\left(\frac{1{,}000}{10} - 50\right) =$$

200 gal storage capacity

so that if the demand of 100 gal continues for 4 hours, needing 400 gallons of hot water, the heater will supply 200 gallons recovery during the 4 hours while the storage

TABLE 1—WATER HEATER CAPACITIES, TEMPERATURE RISE 90 DEG, THERMAL EFFICIENCY, 70%*

Heater Size, Gal	Heater Input, Btu	Recovery Rate, Gal per Hr	Gal 90 Deg Rise Water Available at End of Specified Hours 1	2	3	4
20	24,000	22.3	36	59	81	103
30	27,000	25.1	46	71	96	121
40	34,000	31.6	60	91	124	155
50	40,000	37.2	72	109	147	184
60	47,000	43.7	86	129	173	217
75	60,000	55.8	99	139	199	250
100	78,000	72.3	103	150	225	283

*Based upon data of E. A. Clifford, A. O. Smith Corp., LP-Gas, Nov. 1950.

*Numbers in parentheses refer to references at the end of article.

tank must provide the balance of 200 gal. During the other 20 hours of the day, the heater can not only supply sufficient hot water to meet full needs, but it has the capacity to build up the required 200 gal hot water storage.

3. *Office or loft buildings.* Hours of use of the maximum demand are short, not exceeding a total of 2 hours. Hot water is used only at wash-up and lunch periods. Hot water requirements for cleaning floors, generally at night, windows or other maintenance, seem to be staggered so that these requirements during any hour, are well below any installed heater or boiler capacity designed to supply the maximum demand periods. Hot water need only be drawn from the storage tank for periods totaling not more than 2 hours. The maximum hour was found to have the ratio of 1 to 7.5 or 13.4% of the 24-hour consumption.

$$B = \frac{D}{20} = \frac{1{,}000}{20} =$$

50 gph heater capacity per 1,000 gal daily consumption

$$T = 2\left(\frac{D}{7.5} - B\right) = 2\left(\frac{1{,}000}{7.5} - 50\right) =$$

167 gallons storage tank capacity

The heater will deliver about 25 gph hot water to the storage tank, to provide the necessary reserve supply for the two peak hours of lunch and 5 p.m. clean-up.

4. *One-meal restaurants.* These usually operate between 10 a.m. and 3 p.m., with their maximum demand between 11 a.m. and 2 p.m. While dishwashing requirements last only 3 hours, the demand may be very high. The maximum hour will average about 1 to 5 in ratio, or 20% of the 24-hour consumption. The 3-hour usage of this demand means 60% of the day's consumption. On the basis of 1,000 gal consumption per day figured within the safety factor of a 20-hour day, the heater capacity will be:

$$B = \frac{1{,}000}{20} = 50 \text{ gph recovery}$$

capable of supplying water at the rate of 50 gph or 150 gal for the 3 hours of heavy demand. The storage reserve must supply the balance of the 60% of 1,000 gal of consumption or 600 gal, which is a net requirement of 450 gallons. The storage capacity calculates to be:

$$T = 3\left(\frac{D}{5} - B\right) = 3\left(\frac{1{,}000}{5} - 50\right) =$$

450 gal storage

After the peak load has been met, the hot water heater has excess capacity to build up storage and to take care of the relatively large standby losses of heat from the surfaces of the idle equipment, piping and tank. It also has ample capacity to cover the maintenance of the building, cleaning, and other uses.

TABLE 2—RELATION BETWEEN DISHWASHING AND PRICE OF MEAL

Ratio of Price of Meals	Relative Usage of Hot Water	
	Hand Dishwashing	Machine Dishwashing
1	0.5	1.0
2	1.0	2.0
3	1.5	4.0

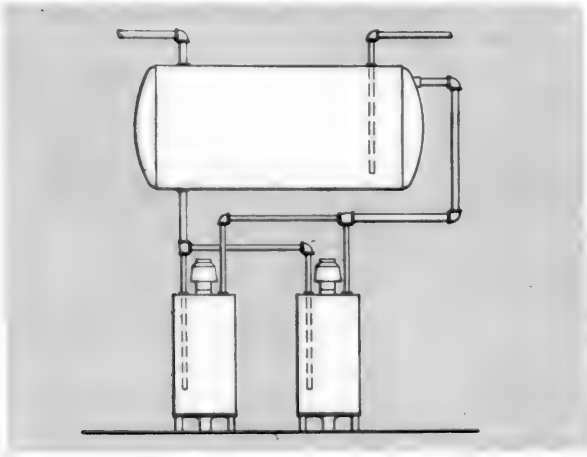


Fig. 1. Vertical storage tank heaters with storage tank overhead. Courtesy, Sellers Engineering Co.

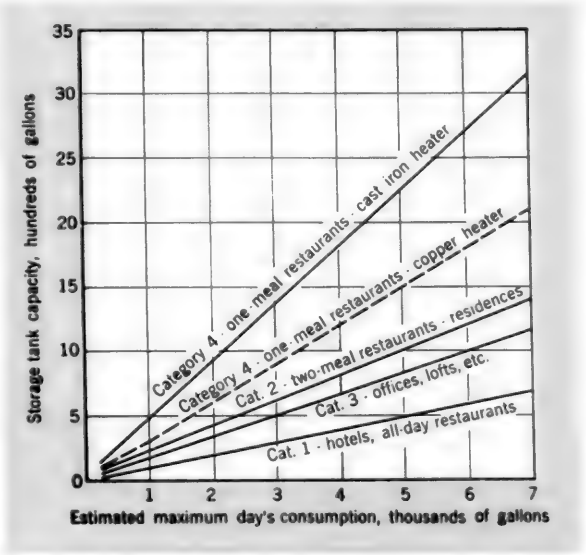

Storage tank capacity, hundreds of gallons
Estimated maximum day's consumption, thousands of gallons
Category 4 - one-meal restaurants - cast iron heater
Category 4 - one-meal restaurants - copper heater
Cat. 2 - two-meal restaurants - residences
Cat. 3 - offices, lofts, etc.
Cat. 1 - hotels, all-day restaurants

Fig. 2. Determining tank capacity. Source: Hot Water Supply Manual, American Gas Products Co.

Deviation of Basic Data

While these examples are given in the four categories, there are many cases that deviate from these basic types. For such cases, similar basic data can easily be derived, either by design estimates from past experiences, or general practices established by local groups, or by actual hourly and daily metering during operating periods. Tests should be run for at least a week in order to determine maximum days and hours. Fridays may be the peak days. Peak hours may vary for different days. By plotting the hourly readings for the maximum day, all of the data can be derived and calculations made. If the total hot water in the maximum 24-hour consumption shows 400 gal and the maximum hour reads 80 gallons used, the ratio is 80 to 400 or 1 to 5, 20%. If this draw-off of approximamtely 80 gallons shows up for a total of 4 hours out of 24, this

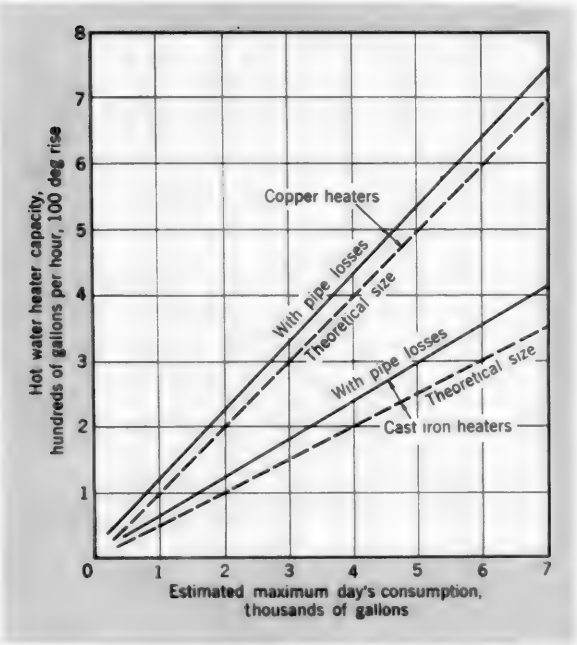

Hot water heater capacity, hundreds of gallons per hour, 100 deg rise
Estimated maximum day's consumption, thousands of gallons
Copper heaters
With pipe losses
Theoretical size
With pipe losses
Theoretical size
Cast iron heaters

Fig. 3. Determination of heater size. Source: American Gas Association, Industrial Series, Water Heating.

maximum drain on the system was 4 x 80 or 320 gallons. The heater size would calculate to be:

$$B = \frac{\text{400 gallons per day}}{\text{20 hours net}} = \text{20 gal hourly heater capacity}$$

Storage capacity would then become:

$$T = 4\left(\frac{400}{5} - 20\right) = 240 \text{ gal}$$

For a small establishment of this size, a single compact insulated gas water heater with an oversized storage tank might be used, or a small 20 gal automatic gas storage water heater may be combined with an overhead storage tank in a combination that will provide 240 gal storage, as illustrated in Fig. 1. If the heater selected is larger in hourly capacity, say 40 gal, the storage capacity can be reduced:

$$T = 4\left(\frac{400}{5} - 40\right) = 160 \text{ gal}$$

Conversion of Data

To convert calculations from formulas into terms of actual standard sizes of hot water heaters, Table 1 has been computed. Apman developed some variations in his formulas in order to give flexibility in obtaining lowest investment costs, save space and reduce tank size by using standard production equipment available ready for immediate use. Normally the most efficient hourly heating rate is 30% of the tank size. A boiler operating below 60% of capacity can be deemed inefficient, so that oversizing and short operating periods with long off-periods, reduce economy. Apman's short formulas for determining B, heater capacity, are:

Category	*Formula to Derive B*
1	B = 1/15 D − 1/6 T
2	B = 1/10 D − 1/4 T
3	B = 1/8 D − 1/2 T
4	B = 1/5 D − 1/3 T

in which the value of T can be taken as the convenient size of storage available, not too far from the T calculated in the previous formulas. Figure 2 presents curves for quick calculations for determining tank sizes for these categories derived by one source.

Figure 3 provides a quick determination of the water heater size. Attention is invited to the difference between the sizes that should be specified for cast iron and copper coil heaters. The conductivity and heat transfer rate of these metals affect the recovery rate of their heaters. Compensation can be made for different metals accordingly, as indicated in Fig. 3. The more rapid recovery rate of copper coil heaters also affects the capacity of the storage tank required. The copper curve is drawn in for Category 4. Any reduction for other categories can be derived by interpolation, or by estimation between these limits for other metals, such as wrought steel, Everdur and Monel in proportion to their heat conductivity.

RESTAURANTS

All restaurants and food dispensaries use considerable hot and cold water. Sanitary requirements are set up by local or state codes, so that the supply of hot water is of utmost importance. The quantity of both hot and cold water consumed increases generally with the price of the standard of meals served. Quantities are estimated on the basis of per person served for the different meal costs. Estimates are also based upon the types of meals served: Cafeterias, counter-service and one-meal restaurants, etc., as was indicated previously. Hot water consumption increases as mechanical devices replace hand operations, especially in dishwashing.

Table 2 presents the relative values set up as examples of the relation between the average meal price and the hot water consumption. The effect of the utilization of mechanical dishwashing machines is added.

Continuing on the same basis, types of meals served, Table 3 contains estimated averages of both hot and cold water that may be consumed and used per person per meal for various general classifications of restaurants. These estimates should be used only as a starting point because of so many factors involved: Geographical loca-

TABLE 3—ESTIMATED COLD AND HOT WATER CONSUMPTION FOR SOME TYPES OF RESTAURANTS*

Type of Meal	Water Consumption, Gallons per Person per Meal			
	Cold Water		Hot Water	
	Drinking	Total	Hand Dishwashing	Machine Dishwashing
Cafeteria	0.08	0.15	0.5	1.00
Low cost	0.10	0.20	1.0	1.25
Medium cost	0.10	0.25	1.5	2.00
High cost	0.20	0.50	2.0	4.00

*Based on HEATING AND VENTILATING Data Sheets, Nos. 190 and 191.

tion, weather, hours and speed of service, type of service, supply of water, and so on. Less cold water, especially drinking water, would be consumed in a cafeteria where the customer may carry his own tray and usually is in a hurry, than in a top hotel where a waiter keeps customers' glasses constantly filled and discards full glasses. In hot temperatures, especially in arid areas, much more water is consumed than amid snow climates.

Hot Water for Dishwashing

The hours of service also affect hot water consumption in mass feeding. Mackay's estimates for determining peak demand are presented as a curve, Fig. 4. It is based on a figure of 1.37 gal consumed per person per meal. This figure reflects the total volume of hot water required at both normal temperature for general use and very high temperature water used for the final sterilization rinse after washing dishes. He affirms that the longer the meal peak or dishwashing period, this greater spread of load will diminish the consumption per person (2).

These estimates are based upon the hot water flow capacities of the dishwashers of 5 gpm for the single tank,

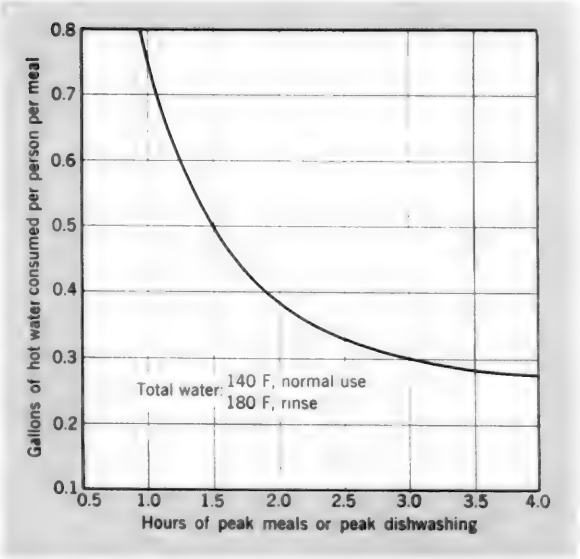


Fig. 4. Basic hot water usage. Source: American Gas Journal, August, 1946.

TABLE 4—HOT WATER DATA FOR RESTAURANTS

Type of Restaurant or Food Dispenser	Hours of Maximum Hot Water Demand			Ratio of Maximum Hourly Demand to 24-Hour Consumption	Hot Water Storage Capacity per 1000 Gal Daily Consumption	Heater Capacity, Per Cent of Max. Daily Consumption
	Use Periods		Intervals Between Hours of Usage			
	Number	Hours Each				
Hotels	2	6	4	1:15	100	10
All-day restaurants	2	6	4	1:15	100	10
Two-meal restaurants	1	4	0	1:10	200	20
One-meal restaurants	1	3	0	1: 5	450	45
Luncheonettes	2	6	4	1:10	300	30

This table is based on information from various sources, basically AGA, Industrial Series Water Heating, p. 48.

4 gpm for two-tank or conveyor types, or 2 gpm for immersion type dishwashers. The use of peak hot water demands affects the computations of all of the items in the hot water system. This has been discussed previously. Table 4 reviews the simple relationships established between the items discussed, for quick or summary reference.

The emphasis given to the dishwasher indicates that it is the largest user of hot water in the field of mass-feeding. It is worth some special mention for it directly concerns the well-being of the food consumer. It converts soiled contaminated utensils into units clean to sight and touch, free of micro-organisms. Dishwashers do the work faster, and as effectively and at lower cost than hand methods (3). Faulty rinsing produces cloudy glassware, stained dishes, spotted silver and excessive consumption of detergents.

The washing machine hot water rinse must:

1. Free utensils of detergent and foreign matter left on the surfaces in the washing process.
2. Raise the temperature of the utensils to that which is lethal to pathogenic micro-organisms.
3. Drain and leave utensils hot enough to air dry.

While utensils may be sanitized at 160 deg in the laboratory, in practice water at a minimum of 170 deg must be sprayed, but because of loss of temperature in the system, 180 deg water must be supplied. At least 1.5 gal must be used during a minimum of 10 seconds on a 20 by 20-inch rack, or 0.375 gal per 100 sq in. of tray area. In order to assure this flow of hot water, the flow pressure in the line should not be less than 15 psi and not less

TABLE 5—ESTIMATED HEAT REQUIREMENTS FOR RESTAURANT AND KITCHEN EQUIPMENT*

Appliance	Unit	Btu per Hour	Equivalent Gallons of Hot Water per Hour, 20 Deg Drop in Temperature
Coffee urns	per gallon	3,400	20
Steam tables	sq ft surface	1,700	11
Plate warmers	per 20 sq ft	34,500	200
Bain marie	per sq ft	3,400	20
Warming ovens	per 20 sq ft	34,500	200
Dish washer	2 compartment	69,000	430
Dish washer	conveyor	69,000	430

*AGA Industrial Gas Series; Bakeries, Hotels and Restaurants.

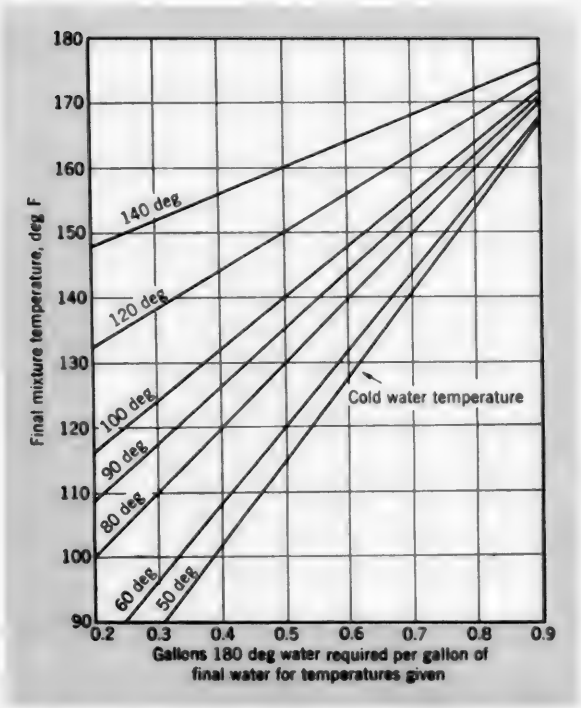


Fig. 5. Mixing hot and cold water to obtain a specific temperature. Source: Sellers Engineering Co.

than 10 psi at the rinse nozzle. A variation of not less than plus or minus 50% is permitted by dishwashing standards of the National Sanitation Foundation (4).

Hartman (4) favors the booster heater, which takes 140 deg water from the storage supply system, through a water pressure regulator set between 15 to 20 psi; then through the gas-fired booster heater to 180 deg to the rinse sprays of the washer. For the average washing machine, he recommends a 40 gal heater for 145 deg effluent water and a 300 gal storage tank. This 145 deg water would go through a 40 gal, 180 deg booster heater and successfully supply the machine at 20 psi pressure, 1.5 gal for the 10-second spray periods, giving a rate of flow of 9 gpm. For 16 x 16-inch trays, the rate of flow would be 7 to 7½ gpm. A single tank machine would require 90 gal per hr when washing 60 racks or trays of dishes per hr, 75 gal per hr for 50 racks, 50 gal per hr for 40 racks. Racks move through machines at normal speeds of 5 to 8 fpm (5).

These small tank dishwashers requiring about 50 gal per hr of rinse water have a capacity of about 1200 pieces per hr. The large washers, using 150 gal per hr, have a capacity of about 6000 pieces per hr.

Use of Hot Water and Steam

There are many jobs in hotels and restaurants where either steam or very hot water may be used. Some of these operations are:

1. Steam tables for keeping foods hot for serving, after they have been prepared in other equipment away from the dispensing or serving point. Very hot water may be circulated.

2. Bain marie for keeping vegetables or sauces hot for serving.

3. Plate warmers where hot water coils can keep stacks of plates warm for serving.

4. Miscellaneous appliances, urns, hot water for soups, and similar uses.

Table 5 lists these kitchen and serving appliances and the approximate heat requirements.

When waters of two different temperatures are mixed in order to obtain a final water of a desired temperature, the final temperature of the mixture can be readily computed. It is often desirable to mix high temperature water in a tempering operation in order to operate different appliances at their individual best temperatures. Depending upon what is available, hot and cold, very high or medium temperatures can be mixed by means of automatic equipment and valves. Using the higher temperature water, which is the costlier water and more desirable to limit, the quantity of this water can be computed from the total final water metered or used and the temperatures involved.

Per cent hot water in the final mixture

$$= \frac{F-C}{(H-F)+(F-C)}$$

Where:	*Example*
F = final water temperature	140 deg
C = cold water temperature	60 deg
H = initial hot water temperature	180 deg

For example:

Per cent of hot water at 180 deg required to produce a final mixture of 140 deg when mixed with 60 F cold water

$$= \frac{140-60}{(180-140)+(140-60)} = 66\tfrac{2}{3}\%$$

The higher the temperature of the hotter water supplied for mixing, the smaller quantity will be required for the job. At the same time the hotter the lower temperature water, the less of the very hot water will be needed. Similarly, the lower the final mixture temperature demanded, the less the hotter water need be consumed. Since 180 deg water is the most expensive of the waters used, its use should be conserved for sterilization and very high temperature specifications.

Figure 5 simplifies the hot water requirements when mixing with colder water, using 180 deg water with other water from 50 to 140 deg. It gives the gallons of the hot water needed per gallon of final mixture of the set temperature. The formula used in its computation is the short form:

$$\text{Gal hot water required} = \frac{F-C}{H-C}$$

Symbols used were explained for the previous formula.

LAUNDRIES

Laundries comprise another group of commercial establishments that use large quantities of hot water. There is a great variety of laundries from the single-purpose unit that is a part of an institution like hospitals, hotels, army posts, towel or diaper service, each serving one type of population or product. These are often referred to as flat work

laundries. Sheets, pillow cases, towels, table linen, form the bulk of material they handle. The types of machines they use are fairly similar and operate at uniform rates and schedules, with the minimum equipment and labor.

Custom or general laundries perform the broadest service with the greatest variety of machines and operating conditions. They may have dry cleaning departments that work in conjunction with regular laundry work, and possibly rug and specialty cleaning as well. The equipment which consumes the major portion of the hot water includes washers, extractors, disinfectors, soap tanks, handy laundry trays, and special equipment of many sorts.

A list of recommended hot water temperatures for different textiles and fabrics, as well as for different operations, is given in Table 6. These temperatures may not be those actually used in many laundries, because for practical reasons, it is not feasible to maintain the various temperatures recommended for each fabric, on a production plant operation as compared with what could be done at home. But the table does serve as a guide to conditions under which best results might be obtained, with possibly the greatest economy of hot water.

About two pounds of dry laundry are figured for each cubic foot of cylinder capacity in the washing machines. The capacity of one 42 by 72-inch washer per one-hour cycle is about 100 pounds of dry laundry (6). A high capacity washer of the same size will wash 200 lb. of dry laundry per hour. A cycle includes loading, washing, rinsing, emptying and unloading. Washers are rated on the diameter and length of the inside of the cylinder. Russell estimates the following minimum requirements of an average laundry per 100 lb. of dry clothes:

Cold water	100 gal
Hot water	80 gal
Steam	30 pounds
Electricity	1 kwh

These minimum figures are exceeded by 50% by many average sized laundries and by 100% by small laundries. Capacities listed in Table 7 should be installed by medium sized flat work laundries using standard washers (6).

TABLE 6—TEMPERATURES RECOMMENDED FOR LAUNDERING VEGETABLE FIBERS, LINENS, COTTONS AND RAYONS*

Textile and Laundry Process		Temp., F
VEGETABLE FIBERS, LINENS AND COTTONS		
Soaking:	White cottons or linens for two hours	100
	Fast colored cottons for 20 minutes	90
	Slightly unfast cottons	90
Washing:	White cottons and linens	140
	Fast colored cottons	130
	Slightly unfast cottons	90
First rinse:	White cottons and linens	130
	Fast colored cottons	130
	Slightly unfast cottons	90
Second and third rinses:	White cottons and linens	115
	Fast colored cottons	115
	Slightly unfast cottons	90
SILKS, RAYONS AND WOOLENS		
	White and fast colors: wash and three rinses at	100
	Unfast colors: wash and three rinses at	85

*Reiter, F. M., Hot Water for Large Volume Needs, Industrial Solutions, Industrial Gas, November, 1954.

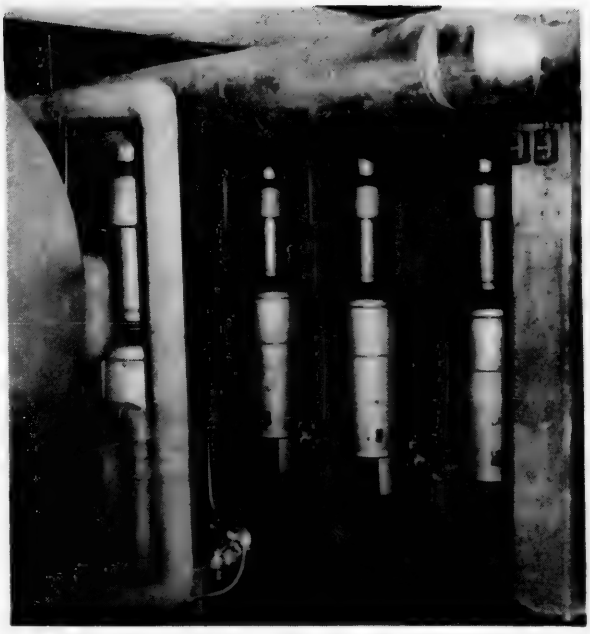


Fig. 6. Twin covered storage hot water tanks each supplied from separate banks of automatic copper coil heaters.

TABLE 7—HOT WATER USED AND STORED FOR WASHERS

Size of Washing Machines	Gallons of Hot Water Used per Hour per Washer	Capacity of Storage Tank per Washer, Gallons
Small	150	100
Medium	200	150
Large	300	200

TABLE 8—DATA FOR MEDIUM SIZE LAUNDRY

Stages		Temp. of Hot Water Deg	Per Cent of Total System Hot Water	Gal of Each Hot Water Used per 100 lb of Dry Wash
No.	Operation			
1	Heat exchanger	80	100	90
2	Normal hot water	130	70	63
3	High temperature	190	30	27

These figures would be the normal estimate of the hot water consumption and the type of equipment for such plant systems.

These figures could be doubled if high duty washers were used. The instantaneous demands are much higher than the average demand so that an extra "fly-wheel" supply of hot water should be available to meet peaks that may occur.

Laundries afford the opportunities for saving fuel or steam by utilizing their series of operations, by means of:

1. Installing heat exchangers of the counterflow type to regain the heat of the effluent high temperature water.
2. Using heaters that heat the hot water in smaller direct fired units rather than with the usual larger central steam boiler that may require firemen and long steam piping.
3. Setting up the largest supply of hot water heating and

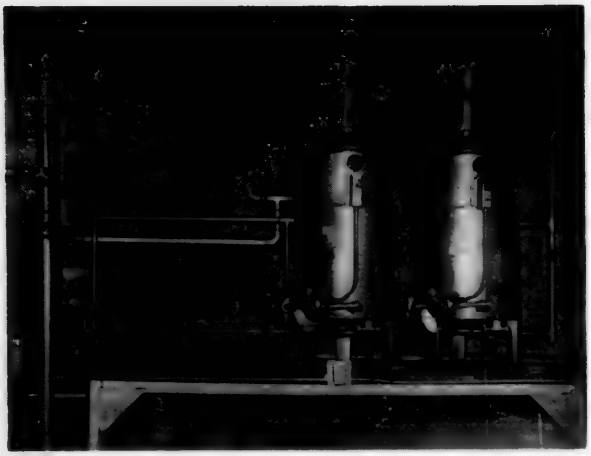


Fig. 7. Pair of small automatic coil heaters that supply 140F water to a Laundrymat. Figs. 6 and 7, courtesy, A. O. Smith Corp.

storage to the normal wash water temperature of about 130 deg and utilizing direct fuel-fired boosters to raise the smaller portion of this water to the 190 deg required for the lesser high temperature water operations.

A medium-sized commercial laundry washing about 200,000 pounds per week, laid plans for using hot water in three stages as listed in Table 8 (7).

The use of this three-stage method of heating hot water was expected to:

1. Give great flexibility of operations, as would be obtained with multiple groups of small normal and booster heaters.
2. It would provide savings in fuel, maintenance, investment and labor.
3. The use of automatic controls on temperatures of hot water and on the water flow for each segment of the plant would augment these savings.

It was estimated that as much as 30% of the older central boiler system's costs would be saved, in annual operations.

Figure 6 portrays the installation of twin storage tanks each utilizing three booster type copper coil heaters. This picture serves to illustrate many of the concepts discussed up to this time: Small compact installation that is fully automatic; no valuable floor space required; insulated piping and tanks; good venting; considerable capacity with low investment and operating costs. In Fig. 7 are two Burkay hot water unit heaters mounted high on the wall, out of the way. Each unit has a capacity input of 190,000 Btu per hr, supplying ample hot water to a Laundromat. They provide 180 gal per hr of 140 deg water utilizing a 350 gal storage tank. This copper coiled water heater is capable of two-stage or booster heating by means of a helical coil and a radiator coil that is mounted above it.

Where a laundry hot water heating system is supplied with steam from a central source, the multi-stage idea can be carried through by means of an auxiliary unit steam boiler as a booster. An arrangement of an auxiliary small gas-fired unit boiler tied into the steam coil hot water heating system supplied from the coal-fired boiler is shown in Fig. 8. These two boilers can be designed for parallel operation, for light loads, or in series with a separate storage auxiliary tank for the high temperature water. This steam heated system is especially useful in areas of extremely hard water.

INDUSTRIAL USES OF HOT WATER

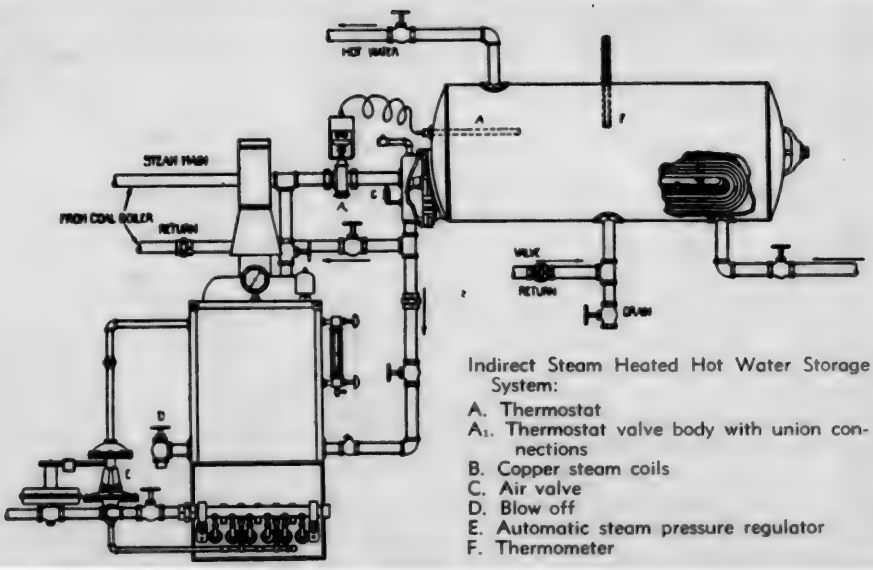
While the overall picture of hot water utilization is essentially the same in all fields, there are many individual operations found in industry that are not encountered in commercial and residential applications. Manufacturing is even further removed from the direct personal factors. We leave the fields of sanitation, comfort and food preparation which so closely affect the human being. We consider metals, fabricated parts and the treatment of mate-

TABLE 9—SOME INDUSTRIAL PROCESS USES FOR HOT WATER*

Process	Acid	Alkali	Neutral
Ferrous metals, iron and steel			
Galvanizing	pickle	wash	rinses
Tinning	pickle	—	wash
Bonderizing	rust pickle	cleaning	rinses
	—	chemicals	rinses
Paint preparation	rust pickle	cleaning	rinses
	—	chemicals	rinses
Porcelain enameling	rust pickle	cleaning	rinses
Pipe coating	pickle	—	rinses
	priming	—	—
Plating	special solutions	cleaning	rinses
Wire patenting	pickle	—	rinses
Heat treating	pickling	cleaning	quench
Non-ferrous; copper, aluminum and brass			
Anodizing	—	oxidizing	rinses
Plating	pickle	cleaning	rinses
	special solutions	cleaning	rinses
Lithographing, painting	—	cleaning	rinses
Coating	clean	cleaning	rinses
Food products			
Selected raw foods	—	treating	rinses scalding blanching
Containers	cleaning sterilizing	cleaning —	rinses sterilizing
Candies	—	—	processing
Soups, syrups	—	—	boiling processing
Textiles			
Printing, finishing colors	dyes	—	rinses
Processing	bleaching	neutralizing	rinses
Cleaning	—	soaps	rinses
		detergents	rinses
Shrinking, sanfordizing	—	—	solutions
Wood processing			
Preservation	penta, salts, chemicals	—	—
Automotive operations			
Paint preparation	rust pickle	cleaning	rinses
	—	chemicals	rinses
Radiator Work	lime solvents	cleaning	rinses
Replating	pickle	cleaning	rinses
Grease removal, engine cleaning	—	cleaners	rinses
Other liquids heated with hot water, high temperature water			
Solvents; degreasing, cleaning, vaporizing, recovering.			
Melting waxes, glues, greases.			
Preheating materials and liquids; in heat exchangers.			
Special winter uses; prevention of freezing, warming foundry sands, heating.			

Compiled by author, Industrial Gas, August, 1954.

Fig. 8. Auxiliary small gas-fired steam boiler used with steam from central coil-burning boiler system. Steam coils inside of storage tank can be removed for cleaning.



Indirect Steam Heated Hot Water Storage System:

A. Thermostat
A_1. Thermostat valve body with union connections
B. Copper steam coils
C. Air valve
D. Blow off
E. Automatic steam pressure regulator
F. Thermometer

rials. Instead of baths for individuals and personal things, we have chemical solutions, rinses, acids, paints and coatings.

Table 9 gives a summary list of some of the industrial uses of hot water, either in the form of acid or alkali solutions or as plain hot water rinses, which will serve as the basis of discussion for hot water use in the industrial field.

Equipment Used

The types of equipment using these solutions or hot water vary as widely as the number of products processed. Small parts may be carried by hand in metal mesh baskets from the first stationary floor tanks of alkali or acid liquids to a neutralizing tank and through one or more hot water rinse tanks. Larger parts may be transported through these same cycles in larger tanks by means of conveyors. Serving the largest equipment are conveyors which carry larger pieces through sprays held in chambers or ovens. These may be considered the equivalent of the automatic dish-washers in the restaurant field, or the continuous laundry machines. Completely assembled automobile bodies may travel through large cleaning, rinsing, bonderizing, drying, paint spraying and baking ovens in a continuous production line, all automatically controlled and operated in practically every phase of these liquid-using operations. Hot water chambers are interspersed throughout the system to rinse and wash the material being processed.

The liquids contained in the tanks of these machines may be heated directly by means of immersion heaters designed to conduct the gases from the fuel through pipes or ducts that may run through the tanks. In very large plants, steam from the central boiler plant supplies the heat in steam coils laid along the sides and/or bottoms of the tanks. In small plants, the tanks may have gas burners under them, purchased complete as tank heaters, or constructed within the plant. Many types of direct heaters, of water tanks can be obtained from manufacturers or built to suit specific operations within the plant. Manufacturers' representatives or local engineers can advise on the proper sizes and designs to fit particular jobs. Unlike homes or apartment buildings where standard sizes of water heaters can be purchased directly from plumbing supply houses. industrial equipment varies widely and must be precisely prescribed for each operation.

In cases of small tanks, for rinse water or neutral solutions, standard gas-fired coil heaters, often called range boiler coil heaters, can be attached to the side of the tanks, singly or in multiple, similar to the use of such coil heaters placed under large hot water storage tanks. The principle is the same. Care must be exercised in designing sufficient head or height to assure natural circulation. A minimum of impedimenta is essential, with no obstructions or accumulations of dirt or sediment that might flow into the bottom return line by flush connections. Where circulating pumps are utilized, larger capacity heaters can be used, and bends and restrictions are not so critical.

For tanks made of wood or ceramic materials, or lined with lead, rubber or other solution-resistant or protective coatings, direct firing cannot be used. Immersion heating can be utilized by direct firing into combustion loops or larger flues that can run through the tank like the fire tubes of horizontal boilers. Submerged pressure burners

TABLE 10—QUANTITY OF WATER CONTAINED IN RECTANGULAR TANKS.

Width of Tank, Ft.	Gallons of Water Unit of Depth per Foot Length Insides of Tank	
	Per Foot of Depth	Per Inch of Depth
2.0	14.96	1.247
2.5	18.70	1.558
3.0	22.44	1.867
3.5	26.18	2.182
4.0	29.92	2.493
4.5	33.66	2.805
5.0	37.40	3.117
6.0	44.88	3.740
8.0	59.84	4.987
10.0	74.81	6.234

Liquids held in tanks of dimensions other than the above can be determined readily as fractions or multiples of the above quantities.

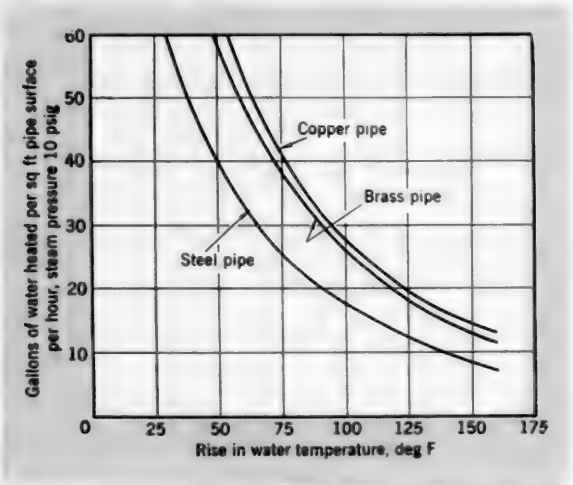


Fig. 9. Quantity of water heated by steam coils. Source: American Gas Products Co.

TABLE 11—PROPERTIES OF FLAMMABLE SOLVENTS AND THINNERS USED IN PAINT AND CLEANING OPERATIONS INDUSTRIAL PLANTS.*

Solvent	Flash Point, Closed Cup, Deg	Explosive Limits, Per Cent of Volume in Air		Vapor Density Air = 1
		Lower	Upper	
Acetone	0	2.15	13.0	2.00
Amyl acetate	76	1.1	. . .	4.49
Benzene	91	1.4	8.0	2.77
Ethyl alcohol	55	3.28	19.0	1.59
Gasoline	−50	1.3	6.0	3 to 4
Kerosene	150	—	—	—
Mineral spirits	100	1.1	6.0	3
Stoddard solvents	100	1.1	6.0	3
Turpentine	95	0.8	—	—
Xylol	63	1.0	—	3.66

*Reiter, F. M., Hot Water for Large Volume Needs, Industrial Solutions, Indirect Heating, Industrial Gas, September, 1954.

have been developed for firing the combustion gases directly into the water, operating like under-water torches. Such equipment might be used where other heating media are unavailable.

Carrying this direct heating of liquids in tanks further toward indirect or remote sources of heat, one can consider solutions or liquids that produce vapors that give up their heat to the metal parts by condensing on them. This acts simultaneously as solvents or cleaners and is used widely in vapor degreasing of metal parts that come from various machining operations and the parts are covered with oil.

The heating equipment, boiler or oil heater, are isolated elsewhere, behind separating walls, and the heating fluid circulated through coils or jackets for the process work. In paint shops or areas where solvents or thinners may evaporate or accumulate, it is necessary to remove heating equipment to another point.

Table 10 gives the quantity of water or liquid contained in rectangular tanks per foot or inch of depth, per foot length so that computations can be made readily for any tanks under consideration. The flammable properties of the more common types of solvents used in industry are listed in Table 11. The densities of the vapors of these liquids are included in order to point out that the vapors of most of these solvents and thinners are heavier than air and will flow along the floor like water. Fuel-fired equipment, such as boilers and heaters located on the floor or in a depressed pit, become a hazard.

The use of direct fuel firing of smaller water or liquid heating appliances is mentioned because of the fact that during the warm summer periods, the large central boiler plant may not be operated and steam may not be available. Frequently these smaller pieces of equipment are placed close to other processes using electricity, gas or other sources of heat, so that these sources are readily available for hot water heating or for industrial solutions. Jacketed kettles could be used with some of the very high temperature liquid media mentioned.

Steam is a very useful medium for heating water or liquids in industrial open tanks. Steam can be utilized directly for heating water by blowing the live steam through open nozzles or jets into the liquid. Live steam will very quickly heat up industrial rinse water where dilution by the condensed steam has no deleterious effect on production results. The heat given up by each pound of steam is considerable, about 970 Btu for each pound condensed. Steam is adapted for heating water contained in wooden, ceramic or lined open tanks. Table 12 notes the steam flow capacity of various sizes of jets or nozzles, for different steam pressures, in terms of boiler horsepower required to supply the steam. Each boiler horsepower is equivalent to the supply of 34.5 lb of steam per hour at atmospheric pressure and 212 deg steam temperature. In blowing live steam into cold water, directing the steam jet through a suction tee or siphon will not only reduce the noise, but will accelerate circulation of the water and the more rapid equalization of the temperatures throughout the volume of the tank.

For most liquid heating operations, live steam cannot be used directly in heating, because:

TABLE 12—BOILER HORSEPOWER OF STEAM REQUIRED TO SUPPLY VARIOUS SIZE STEAM NOZZLES AT STATED PRESSURES.*

Nozzle Size, Inches Dia.	Steam Pressure, Psig					
	10	30	50	70	90	100
	Boiler Horsepower Equivalent in Steam Supplied					
1/32	0.04	0.07	0.10	0.13	0.16	0.18
1/16	0.12	0.24	0.35	0.45	0.55	0.61
3/32	0.31	0.57	0.81	1.06	1.30	1.45
1/8	0.60	1.0	1.40	1.90	2.30	2.50
3/16	1.20	2.20	3.20	4.20	5.20	5.70
1/4	2.20	4.00	5.70	7.50	9.20	10.10
5/16	3.30	6.00	8.90	11.60	14.60	15.70
3/8	4.90	8.80	12.70	16.70	20.70	22.70
7/16	6.50	12	17.30	22.70	28.10	31
1/2	8.50	15.50	22.50	29.50	36.50	40

*Figures are based upon American Gas Association boiler data. They are useful in estimating steam requirements and boiler capacity needed to supply steam jets in direct hot water heating by means of direct live steam.

TABLE 13—CHANGE IN GAL PER HR PER SQ FT PIPE SURFACE AS RELATED TO EACH 5 PSI CHANGE IN STEAM PRESSURE.

Rise in Temp. of Heated Water, Deg F	Approx. Gallons Change per Hour per Sq Ft Pipe Surface		
	Copper Pipe	Brass Pipe	Steel Pipe
60	4.4	4.2	2.8
80	3.4	3.1	2.0
100	2.8	2.7	1.8
120	2.4	2.3	1.5
140	2.3	2.2	1.4

1. The removal of the steam without return of any condensate may not be conducive to best low cost operations of the boiler, particularly where careful treatment of the boiler feed water is required.

2. Adding this steam condensate to the liquid of the tank may reduce the efficacy and strength of the solution by too rapid dilution.

Steam can be efficiently and capably used for heating by indirect means, by passing the steam through coils laid in the tank, or in jackets covering the kettles, for the transfer of its heat to the liquid contents of the appliances. These steam coils are most economically operated when trapped and automatically controlled to prevent waste of steam heat and to reduce steam consumption. Traps return the clean condensate to the boilers or to a tank return pump system. Figure 9 shows how many gallons of water can be heated per hour per square foot of steam coil heating surface of copper, brass and steel piping, based upon 10 psig steam pressure. For each 5 psi change in pressure, Table 13 lists the average corresponding change in the number of gallons heated per hour per square foot of surface.

Figure 10 supplies additional basic data on determining the heat capacities of steam pipe coils in heating water in terms of lengths of various diameters of pipe, required for the job. In order to calculate the length of pipe to be used in making up a coil to heat the water in a given tank. one must ascertain:

1. The diameter of pipe to be used, avoiding small sizes if possible.

2. The steam pressure available, since higher pressures give higher temperatures and greater speed of heating.

3. The capacity of the tank in gallons to be actually heated. If the tank is to be half full, figuring the total capacity of the tank would give excessive steam demand.

4. The approximate time allowed for heating the water in the tank. This is very important because the production line should not be delayed. The size of coil and tank must conform to this timing.

A tabulation of external surface area of different sizes of standard grade pipe is given in Table 14.

The pounds of material heated is not as important as may be suspected, because the time set for heating the water in the tank will require a greater rate of heat input from the steam coil or other source of heat, than the metal products will carry out of the tank. If the material is bulky, the size of the tank will be larger correspondingly, and the heat put into the water and retained by the larger volume of water will generally offset the greater weight of the products passing through. It is advantageous to make the tank larger than the size accurately computed for containing the materials. The extra bulk of hot water will act as a fly-wheel or storage of extra heat that will prevent a drop in temperature if a sudden load comes through. Table 15 gives the heat required to raise the temperatures of a number of common metals, solutions, solids and liquids that are encountered in manufacturing processes. These materials are among those that either make up the containers, solutions or the products processed in operations involving water or liquid heating. When the specific heats of these materials are compared to water as 1.00, one can see that heating up the tank full of water in an hour will require more heat capacity than heating up any of the material processed.

The heat that is supplied within the coils for transmission to the water or liquid in the tanks merits consideration. Various media are mentioned as steam, oils, organic compounds such as diphenyl or Dowtherm and high temperature water. Table 16 compares steam with Dowtherm A. Vaporization of Dowtherm A starts at about 490 deg at atmospheric pressure and reaches the equivalent temperature of 600 deg at 31.3 psig; saturated steam would reach this temperature at 1,600 psia. There are

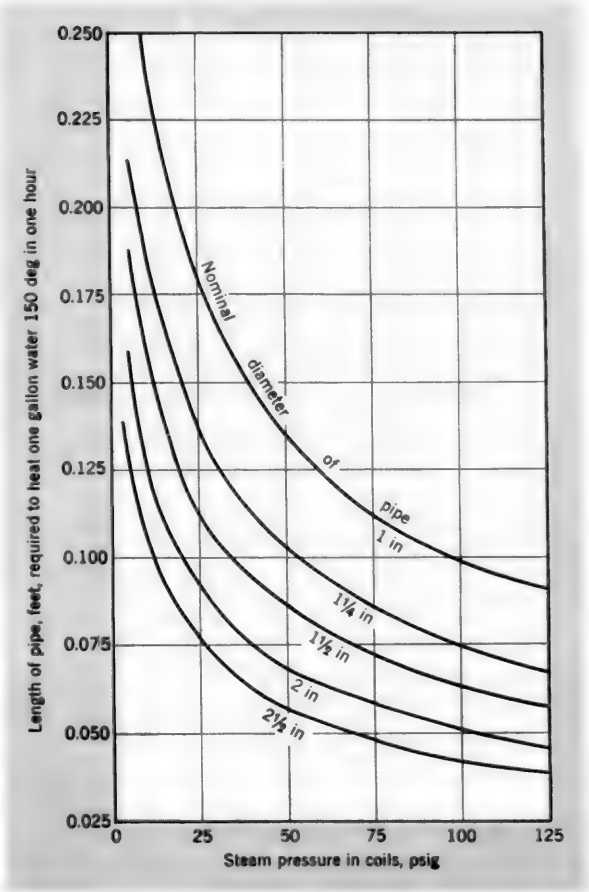


Fig. 10. Length of pipe of steam coils. Basic data from Eclipse Fuel Engineering Data Book.

TABLE 14—EXTERNAL SURFACE AREA OF DIFFERENT SIZES OF PIPE, STANDARD GRADE.

Nominal Pipe Size, Inches	External Pipe Surface, Sq Ft per Foot Length	Weight, Pounds per Foot Length
½	0.210	0.850
¾	0.275	1.130
1	0.346	1.678
1¼	0.434	2.272
1½	0.494	2.717
2	0.622	3.652
2½	0.753	5.793
3	0.916	7.575
4	1.175	10.790
5	1.455	14.617
6	1.739	18.987

Multiply the total length of pipe coil, in feet, by the above surface constants for the given size of pipe to determine the total surface area of heat transfer contact. Basic data source, National Pipe Standards, National Tube Company.

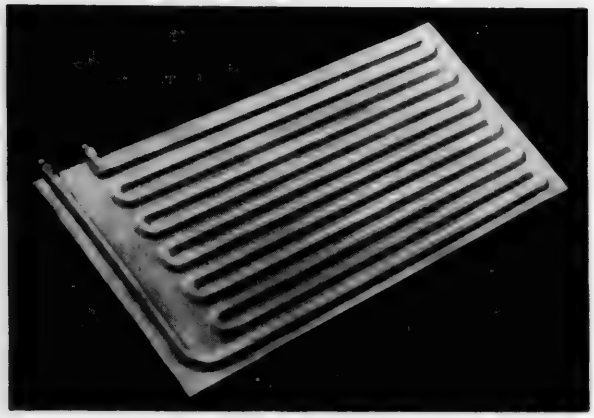


Fig. 11. Welded pressed sheet coils serving as heat exchanger for liquids in tanks. Courtesy, Dean Products, Inc.

indirectly heated industrial jobs that warrant consideration of such special heating media.

Where very high temperatures are required in the form of steam or vapor without the ability of the equipment to withstand high pressures, high boiling liquids are available up to 750 deg at reasonable pressures. These organic chemical liquids, such as glycols, diphenyl and Dowtherm, are useful in processing such products as foods, paints, varnishes, drugs, pharmaceuticals, petroleum, de-icing, melting snow, and high temperature chemical operations. Boilers and forced circulating liquid heaters are on the market in standard sizes from less than 250,000 to over 35,000,000 Btu per hr.

What has been said of the usefulness of organic liquids applies to high temperature hot water up to the pressure limits indicated in the steam tables. The value of hot water as a heating medium lies in its greater heat content per cubic foot or volume of the heating medium circulated, as given in Table 17.

The use of high temperature hot water circulating heating in the industrial field merits consideration because of

TABLE 15—THERMAL PROPERTIES OF MATERIALS COMMONLY USED IN INDUSTRY WITH HOT WATER AND SOLUTIONS

Material	Specific Heat	Heat Capacity. Btu Needed to Raise 1 lb., 100 Deg F	Specific Gravity
Metals			
Aluminum	0.209	20.9	2.67
Brass	0.089	8.9	8.10
Cadmium	0.057	5.7	8.65
Carbon	0.160	16.0	2.10
Chromium	0.104	10.3	—
Copper	0.095	9.5	8.85
Iron, cast	0.119	11.9	7.22
Wrought steel	0.115	11.5	7.90
Lead	0.032	3.2	11.38
Magnesium	0.249	24.9	1.75
Mercury	0.032	3.2	13.58
Nickel	0.109	10.9	8.86
Silver	0.056	5.6	10.51
Tin	0.055	5.5	7.35
Zinc	0.093	9.3	7.14
Non-Metals			
Glass	0.120	12.0	2.70
Marble	0.210	21.0	2.70
Sand	0.191	19.1	1.60
Rubber	0.481	48.1	1.20
Vulcanite	0.331	33.1	1.60
Wood, average pine	0.327	32.7	0.60
Paraffin	0.622	62.2	0.90
Liquids or Solutions			
Alcohol, ethyl	0.648	64.8	0.79
Benzene	0.423	42.3	0.69
Glycerine (glycols)	0.576	57.6	1.50
Castor oil	0.434	43.4	0.96
Olive oil	0.471	47.1	0.92
Petroleum oils	0.511	51.1	0.81
Sodium hydroxide, 50% sol.	0.943	94.3	1.52
Sea water	0.938	93.8	1.03
Copper sulfate, 50% sol.	0.848	84.8	1.40
Sulfhuric acid, 25% sol.	0.854	85.4	1.21
Sulfuric acid, 50% sol.	0.884	88.4	1.52
Sulfuric acid, 100% sol.	0.956	95.6	1.83
Water	1.000	100.0	1.00

TABLE 16—TEMPERATURES, PRESSURES AND HEAT AVAILABLE FROM STEAM, HIGH TEMPERATURE HOT WATER OR DOWTHERM A.

Pressure of Fluid, Psig	Temperature of Fluid, Deg F	Heat available above 32 F, Btu per lb	Density, lb per Cu Ft	
			Vapor	Liquid
a. Steam and high temperature hot water.				
0	212	1152	0.0373	59.8
10	240	1162	0.0613	59.2
20	259	1169	0.0840	58.6
30	274	1174	0.1063	58.3
40	287	1178	0.1285	57.8
50	298	1181	0.1502	57.5
75	320	1187	0.2309	57.2
100	338	1191	0.2580	56.1
150	366	1196	0.3635	55.0
200	388	1199	0.4570	54.1
1,600	604	—	3.9200	41.9
b. Dowtherm A.				
0.0	490	370	—	—
10.0	550	380	—	—
31.3	600	399	0.6970	49.5
35.9	610	404	0.7740	49.1
40.9	620	410	0.8450	48.7

Source of data: International Boiler Works, Dowtherm Vaporizer Bulletin.

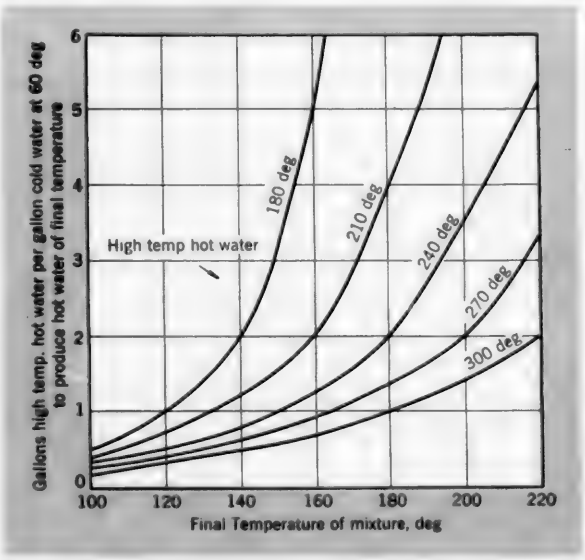


Fig. 12. Amount of high temperature water required to give water a final temperature mixture.

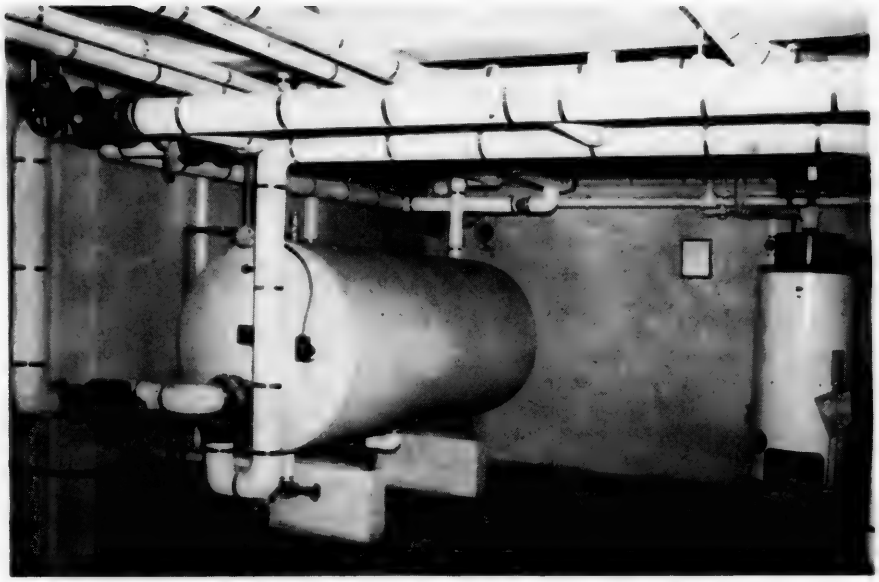


Fig. 13. An installation which uses an auxiliary hot water storage tank served by hot boiler water for heating, and at the right, a standard 85-gal automatic storage gas heater. Courtesy, National Cash Register Co.

TABLE 17—HEAT CONTENT OF HOT WATER AND STEAM*

Temperature Deg F	Total Heat Content, Btu per Cu Ft		Ratio of Heat Available Water to Steam
	Water	Steam	
212	10,760	42.9	250:1
250	13,320	92.9	143:1
300	15,360	177.0	87:1
350	17,870	358.0	50:1

*C-E La Mont Circular, Combustion Engineering Corp.

TABLE 18—COMPARISON OF OPERATIONAL LOSSES*

Type of loss	Operation Losses, Per Cent	
	Steam	High Temp. Water
Radiation	6	4
Blowdown, soot blowing, etc.	3	1
Traps, valves, leaks, pumps, etc.	10	1
Total	19	6

*Harrington, I. P., H-T Water Gives Low Cost Heat at Twenty-Nine Palms, Power Engineering, March, 1954.

easier control of temperatures, flow of heating medium, elimination of steam generating problems, traps, etc., in addition to the high heat capacity of the water.

Where high temperature liquids are circulated for heating other liquids in tanks, pressed forms of coils are available, fabricated from sheets as shown in Fig. 11. The webbing between loops adds considerable heat conducting surface for accelerated heat transfer. These preformed coil sheets are simple to handle and install. They occupy minimum space and are low in maintenance.

High temperature hot water can be supplied at lower costs than the equivalent heat in steam. Hot water was used at a marine training base in California for all purposes in lieu of steam. This hot water was supplied at 100 psig and 338 deg. The efficiency of the steam production was 64.8% against 75.2% for the high temperature water. A comparison of operational losses, in per cent, is given in Table 18.

This high temperature water was used for all purposes: Space heating, kitchens, laundry, dispensary, clinics, messes and washing. By means of heat exchangers and automatic water proportioning mixers, proper temperatures and properties of hot water supplied to all appliances were maintained for each purpose. A tubular heat exchanger was utilized for generating some low pressure steam used in a few operations.

When high temperature water is mixed with cold water to give a desired hot water temperature for industrial purposes, the quantity of initial hot water required can be readily computed. Figure 12 gives the number of gallons of high temperature water required for mixing with one gallon of cold water received at 60 deg to give the final flowing temperatures desired. It is assumed that the mixing valves and equipment is modern and no line or other losses are included. The quantity of final hot water mix will be the sum of one gallon of cold water plus the gallons of high temperature that is added, as shown in the illustration. One might add 10% high temperature water to compensate for heat losses if the distances are not too far. Hot water piping should be covered with insulation to avoid costly heat losses.

An installation which shows tanks and piping excellently covered is shown in Fig. 13. Illustrated is an auxiliary hot water storage tank which utilizes hot boiler water as the heating medium within the bank of heat exchanger tubes, forming the removable heating coil at the bottom of the tank.

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LOUIS BLENDERMANN ON

PIPING AND PLUMBING

Two-Temperature Service Hot Water

ALL new buildings under construction require a service hot water system of sufficient capacity and recovery to fulfill the hot water demands by the building occupants; an adaquate service hot water system is a very important asset in all types of buildings.

Often, however, more than one temperature of service hot water may be required to suit the particular requirements of a building. Besides furnishing hot water for the general fixtures of a building, it is frequently necessary to supply 180 deg F hot water for certain kitchen fixtures. In hospitals it is not unusual to furnish an additional hot water system which supplies water at a temperature different from the main system for special equipment. Schools, for example, require 180 deg water for kitchen fixtures plus the regular service hot water system. In general, where a building may require service hot water at more than one temperature, consideration must be given to the various methods that can be employed to furnish water at the needed temperatures before deciding on the system to install.

Methods of Furnishing Required Temperatures

There are many ways to generate service hot water at varying temperatures and different combinations of hot water generation equipment may be used. However, this article discusses only the hot water storage generator and the manner in which it may be used to supply the necessary hot water temperatures. Regardless of the particular method of hot water generation chosen, a separate system of hot water piping must be installed for each water temperature.

Hot Water Storage Generator

The hot water storage generator is one of the more efficient methods that can be used to generate hot water. With the proper arrangement of piping, valves and controls, a dual system of service hot water can be provided and a typical arrangement of this system is illustrated in Fig. 1.

Steam is used as the heat source for hot water in the storage generator of Fig. 1. Steam passes through the coils within the tank and transmits its heat to the water outside the coil. The steam control, actuated by a thermal element set in the storage tank, controls the range of temperature desired in the storage generator.

In this case we shall assume that a large volume of 180 deg water is demanded by the numerous kitchen fixtures. Therefore, all the water in the tank is heated in excess of 180 deg and this temperature is accurately maintained by the steam control valve.

Pressure and temperature relief valves guard against scalding or equipment damage should the steam control valve fail and excessive pressures and temperature develop in the storage tank. Other safety devices of equal value and importance protect the piping system as shown in the detail.

Water in the storage tank is heated in excess of 180 deg to compensate for heat lost in traveling through the

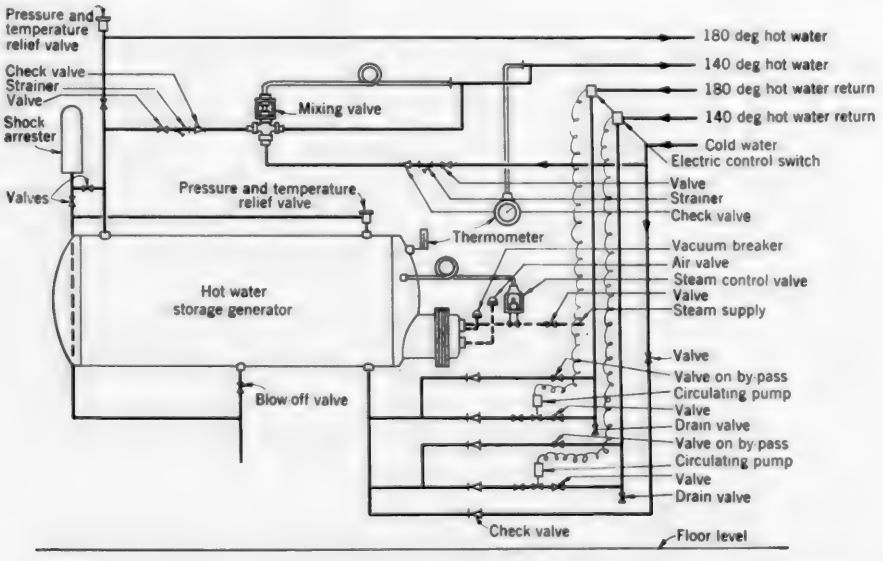


Fig. 1. Detail of hot water storage generator with piping arrangement for two-temperature hot water.

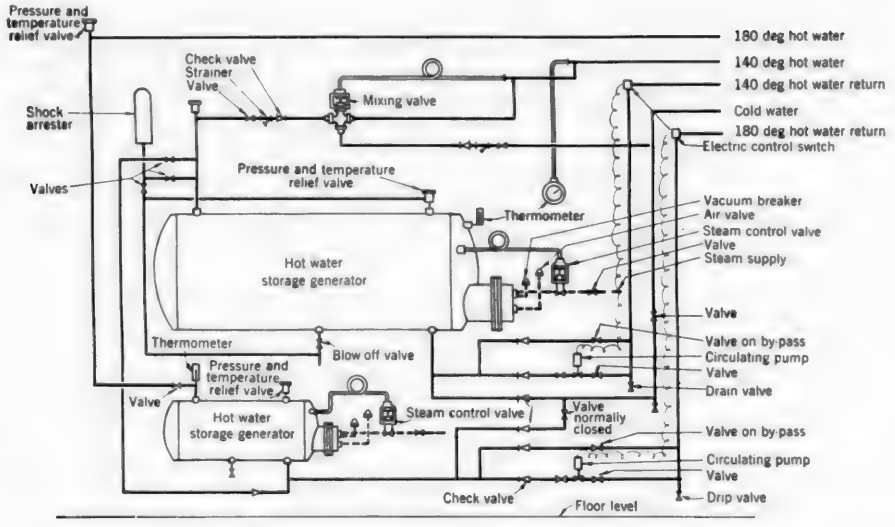


Fig. 2. Piping arrangement for two hot water storage generators and piping arrangement for two-temperature hot water.

pipe to kitchen fixtures. Thermometers set in the water line in the kitchen will help find the temperature at which the water should be regulated in the storage generator to compensate for this pipe line heat loss. After the 180 deg water completes its circuit, it returns to the storage generator via the hot water return line. A circulating pump, installed in the return line and actuated by the electric control switch shown, speeds the movement of the water in this return line when the temperature in the hot water return pipe drops below a desired degree.

For the 140 deg water, a connection is taken from the 180 deg line. The 180 deg water is reduced to 140 deg or any other desired temperature by the mixing valve. A thermometer set in the line as shown, and located to be easily read, facilitates the proper temperature settings. The temperature setting for this supply is also set in excess to provide the desired water temperature at the fixtures; account is taken of a temperature drop of the water in its travel through the pipe. After the 140 deg water has completed its circuit, it, too, returns to the storage generator by way of the hot water return line. A circulating pump on this line performs a similar function as on the 180 deg line.

Bypasses around the circulating pumps permit water circulation in the event of maintenance or repair to the circulating pump. The cold water supply is introduced to the system as shown to temper the cold water with the hot return lines before it reaches the storage generator. This avoids mixing cold water directly with hot water in the tank.

Water hammer eliminators are placed in the piping system at the locations suggested to absorb shock waves set in motion by quick-closing valves and faucets. These devices avoid the noise and damage to the piping system caused by water hammer as this reaction is known. There are several excellent patented shock arrestors that may be used. Water hammer eliminators, of course, must be placed at other points in the piping system to afford complete protection to the piping system.

When this type of system is properly installed, it can be counted upon for efficient operation. Furthermore, it will offer both, a flexible as well as a safe method of furnishing two separate water systems with each service water a different temperature to meet specific building requirements.

Two Hot Water Storage Generators

Often, because of the particular hot water demands of the building, one may desire to design a system that includes two hot water storage generators. The larger storage generator will contain the 140 deg water for the general fixtures of the building while the smaller storage generator will contain the 180 deg water to be used expressly for kitchen fixtures and equipment or perhaps other types of equipment.

Such a system would be appropriate in a school or any other building where 140 deg hot water is needed all year round while the 180 deg water may be required only part of the year or at certain seasons. A typical arrangement of this system is shown in Fig. 2.

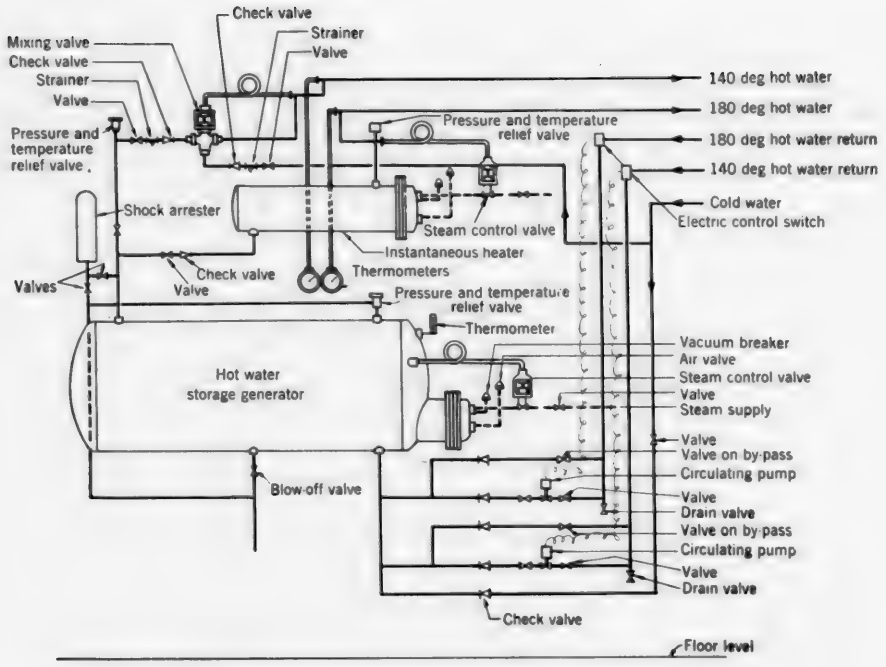
Although, the arrangement of the storages generators in Fig. 2, shows the smaller unit underneath the larger unit, it must be remembered that the illustration is only diagrammatic. The smaller unit can be placed in any position with regard to the larger unit.

For the larger unit, steam is the medium used to generate the hot water. The water is heated in excess of 140 deg, leaves the unit and by means of the mixing valve is maintained at a temperature that will deliver 140 deg or any other temperature that may be desired for the general fixtures of the building. The mixing valve, in addition to maintaining the proper water temperatures also prevents the passage of superheated water to the fixtures in the event that the steam control valve should fail to function.

After the 140 deg water completes it circuit through the piping system it returns to the storage generator via the hot water return line. The circulating pump assures a positive circulation when the water in the return line drops below a prescribed temperature.

The smaller storage generator operates in a manner similar to that of the larger unit with the exception that the 140 deg water from the larger unit is introduced into the system. The 140 deg water is raised in excess of 180 deg to compensate for the heat loss of the water in its travel through the piping to the kitchen fixtures and equipment.

Fig. 3. Piping arrangement for hot water storage generator and instantaneous heater.



After the 180 deg water completes its circuit through the piping system, it returns to the smaller storage generator, via the hot water return line. The hot water return line is also equipped with a circulating pump to provide positive circulation when the water in this line drops below a prescribed temperature.

The valve on the auxiliary cold water supply to this storage generator is normally closed. It is opened only when the 140 deg supply from the larger unit is shut off due to maintenance or repair of the larger unit.

This system is quite efficient and affords the flexibility that is needed in certain types of buildings. Since the smaller unit can be shut off during periods of the year when it is not needed and since the larger unit is required only to furnish 140 deg water, a considerable saving is realized in the generation of hot water.

Hot Water Storage Generator and Instantaneous Heater

Another method of furnishing hot water at two different temperatures is by the arrangement of a hot water storage generator and an instantaneous heater as shown in Fig. 3.

Water at 140 deg is generated in the storage generator while 180 deg water is generated in the instantaneous heater. Here again is a flexible system that is ideally suited for buildings where the 140 deg water is required the year round while the 180 deg water might be required only at certain times of the year for special use.

The 140 deg water leaves the storage generator, and passes through the mixing valve where its temperature is regulated for the general fixtures of the building. After the water has completed its circuit, it returns to the hot water storage generator. The circulating pump installed on the hot water return line, operates the same as that explained for the previous system.

For the 180 deg water, a branch is taken from the 140 deg water line, as shown, and is introduced into the instantaneous heater where the temperature is increased to 180 deg. The temperature of this water is controlled by the steam control valve, placed on the steam supply line. After this water completes its circuit to the kitchen fixtures it returns to the storage generator. A circulating pump is placed on the hot water return line to ensure positive circulation, when required. Thermometers for the 140 and 180 deg water, assist in maintaining the proper water temperatures.

With a system such as shown in Fig. 3, a great deal of flexibility is assured for the particular building requirements.

The systems described are economical in operation in what they offer full utilization of fuel and service. Manufacturers of the proposed equipment should be consulted with regard to the capacity, recommended installation and arrangement of their equipment.

Recommendations for 275-Gallon Tanks

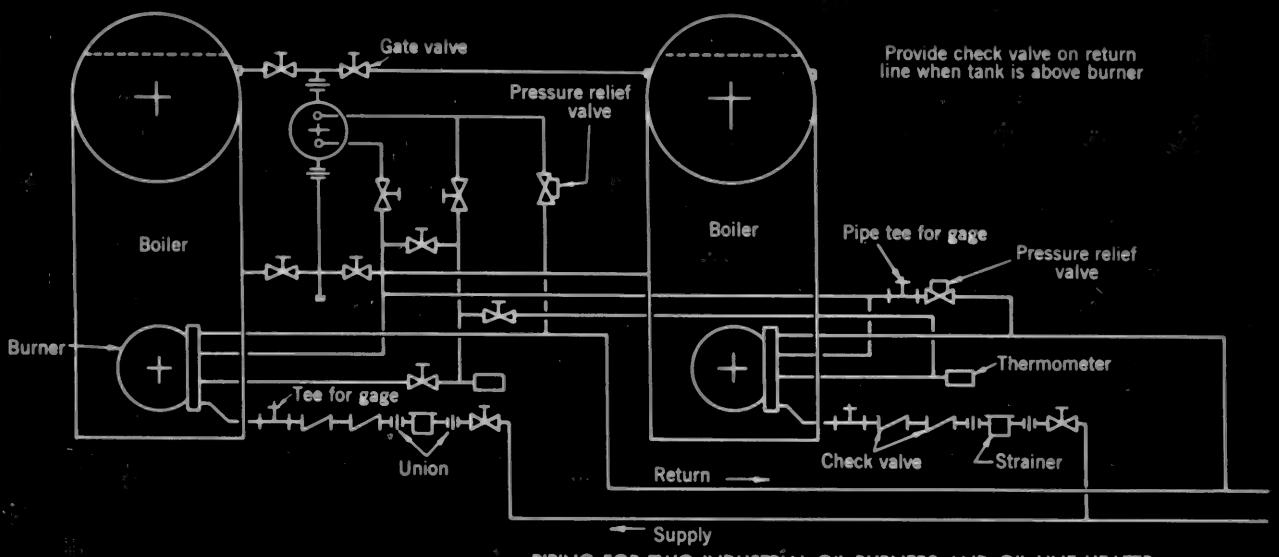
The Technical Division of Oil-Heat Institute of America has recommended to the Flammable Liquids Committee of the National Fire Protection Association that:

1. The burner supply outlet connection for gravity feed 275 gal tanks shall be in the head of the tank and only one such opening shall be provided.

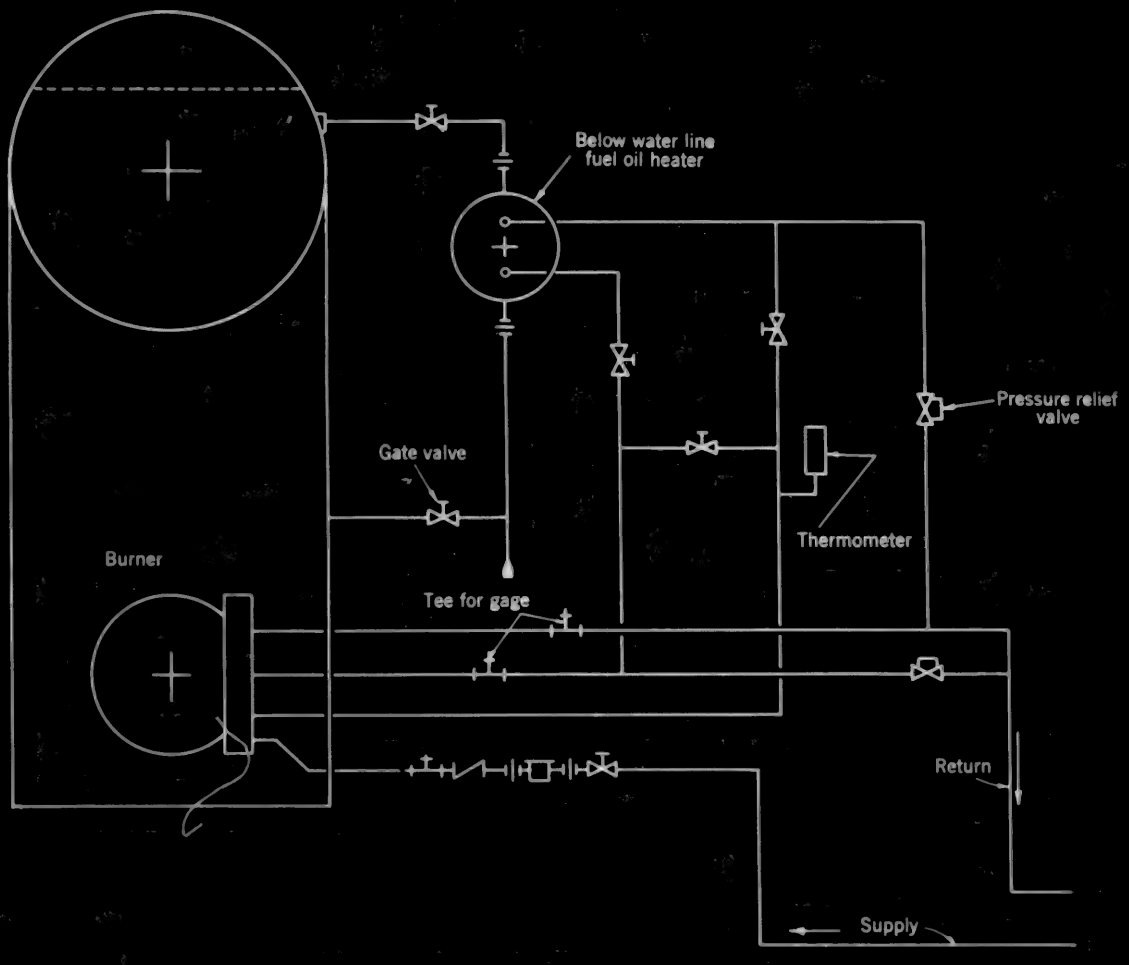
2. The provision in existing regulations, providing for a drain bottom opening and pitching of the tank towards this opening be eliminated.

3. The heating oil supplier should be required to protect the tank with a suitable inhibitor such as three parts sodium nitrite to one part of borax.

PIPING FOR INDUSTRIAL OIL BURNERS



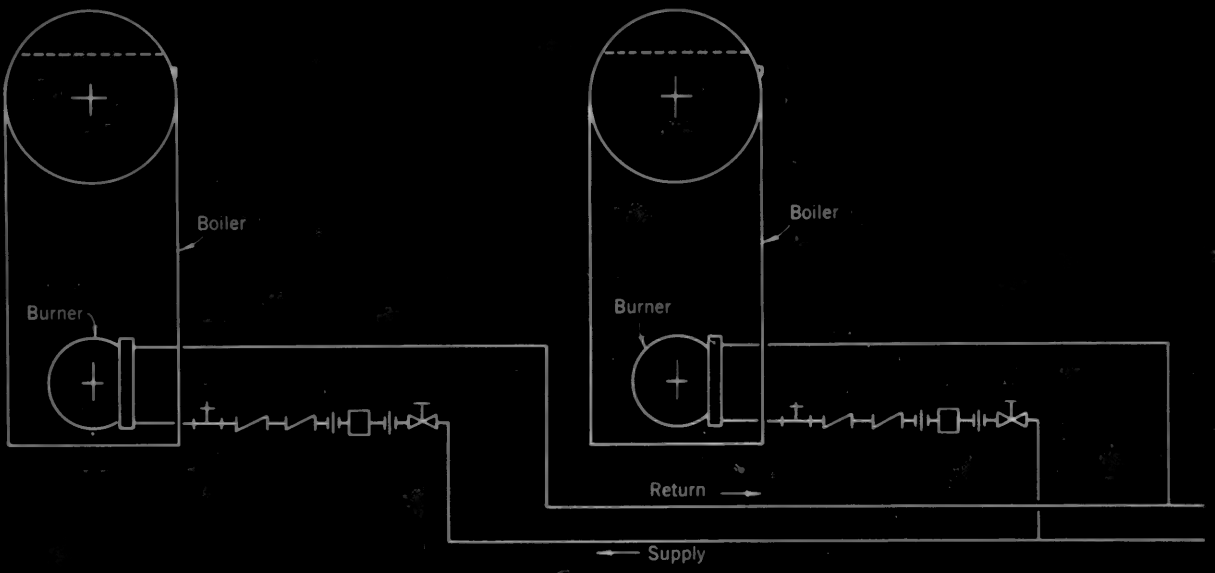
PIPING FOR TWO INDUSTRIAL OIL BURNERS AND OIL LINE HEATER



PIPING FOR ONE INDUSTRIAL BURNER AND ONE OIL LINE HEATER

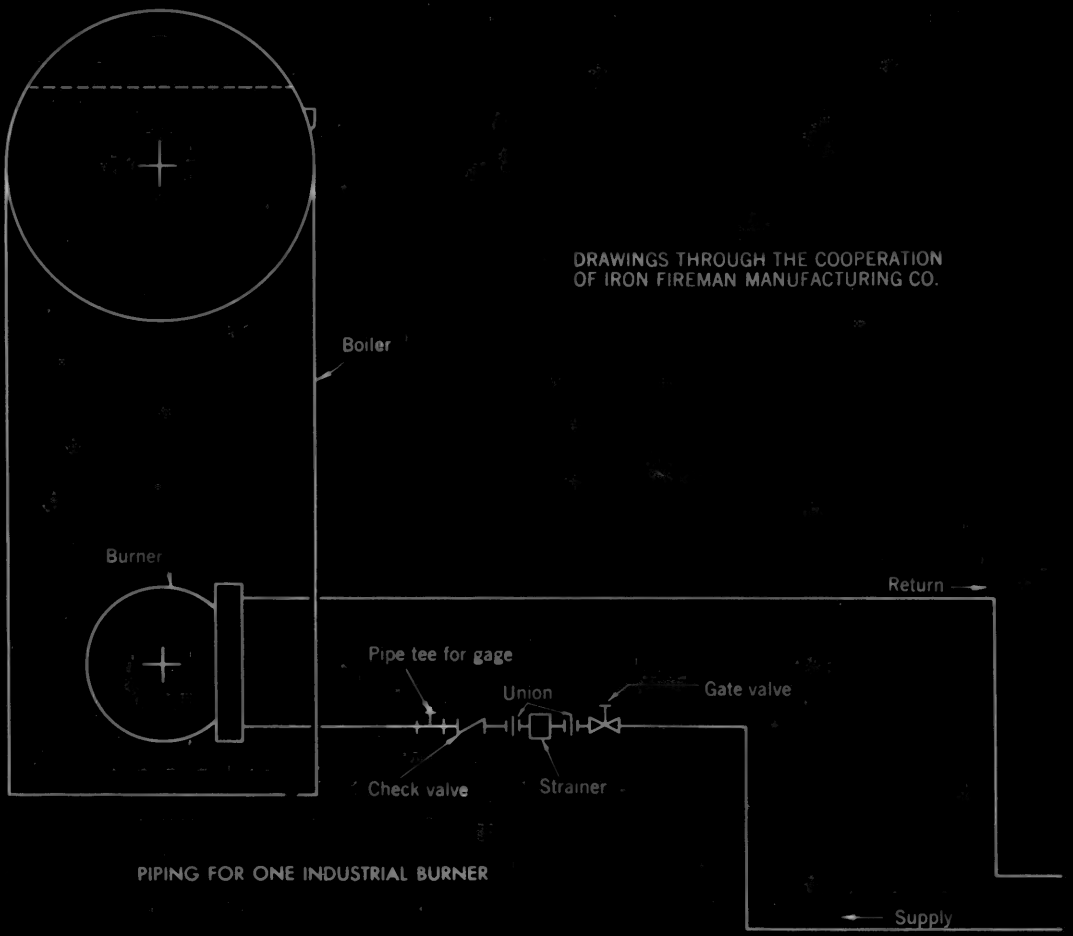
CUT ALONG THIS LINE

PIPING FOR INDUSTRIAL OIL BURNERS



PIPING ARRANGEMENT FOR TWO INDUSTRIAL OIL BURNERS

DRAWINGS THROUGH THE COOPERATION OF IRON FIREMAN MANUFACTURING CO.



PIPING FOR ONE INDUSTRIAL BURNER

Management and Community Opinion on

Air Pollution

WILLIAM W. COOK

Partner, Pendray, Cook & Hoving, New York, N. Y.

An increasing and more aggressive public awareness of air pollution as a nationwide issue is reflected in response to surveys of top industrial executives and law enforcement officials. Industry can help itself by telling the community what it is doing.

THESE days, when anyone quotes the old saw about something being as free as the air you breathe, you can be fairly sure he's not an industrialist.

Our industries, particularly those segments in the chemical and related fields, are finding their efforts to keep America's air fit to breathe not only extremely costly, but often unknown to and therefore unappreciated by their neighbors in communities where their plants are located.

Recognizing that industrial air pollution is frequently as much a public relations as an engineering problem, our public relations counseling firm of Pendray, Cook and Hoving undertook recently to find out how two major groups, whose interests are most directly linked with the problem, viewed the situation.

First, from top executives of major corporations in all parts of the country we wanted answers to such questions as what they considered the chief causes of pollution, whether they thought the situation was improving or getting worse, how much they were spending to combat it, whether they felt they had solved their own problems, and whether they thought an intensified national research program was needed to discover causes and cures.

We chose 177 companies which were leaders in their branches of industry, and all of which were likely to have had air pollution problems because of the nature of their operating processes.

Next, from law enforcement officials charged with protecting residents of major cities against harmful or unpleasant odors and fumes discharged in violation of local ordinances, we sought to learn such things as how many complaints they were receiving about odors, how they rated such factors as smoke, airborne industrial wastes, dust, and other pollutants in importance, whether their communities showed increasing public interest in these matters, and whether they thought they had sufficient legal authority to meet their problems.

Our questionnaire was sent to the chief public official responsible for control of air pollution in 67 major industrial cities. In it, we covered under the heading of odors and fumes all gaseous and vaporous exhausts which have a definite odor, pleasant or objectionable, or which contain water, acid or irritating components such as sulfur dioxide, nitric oxide, etc.

Both surveys provided highly enlightening answers.

Responses from more than half of the industrial companies queried revealed six major conclusions:

(1) Public opinion determines the pace of industry's attack on air pollution. Top management classifies air pollution as a major public relations problem.

(2) The great majority of business executives feel they have improved the air pollution situation in their communities during the last five years and that business spending in this field is on the downgrade. However, the 20 firms that described specific plans will spend alone a total of $52,730,000 in the next five years.

(3) However, almost half of them feel there is need for additional encouragement, in the form of changes in the Federal income tax law such as accelerated amortization, etc., to get business to do more about air pollution control.

(4) Although concern was expressed that local communities sometimes force companies into expensive and unreasonable action, there is vigorous opposition to any additional Federal or state activity.

(5) Many contend that industry has done its share of "cleaning up", but that other causes, such as private dwellings and automobiles, are now primarily responsible for air pollution.

(6) While a majority report a need for more research into causes and cures, the respondents divided almost evenly on the need for a unified national research program or other industry cooperation in this field.

In the second survey, that of law enforcement officials, responses from more than three-fourths yielded these five major conclusions:

(1) Public complaints about odors and fumes are on the increase, although the problem now is ranked fourth in importance by enforcement officials.

(2) Industry is felt to be the major offender, although vehicles and domestic sources rank high. The industries most frequently cited were chemicals, paint and varnish, food processing, rendering plants and plastics.

(3) Industrial firms have found it both difficult and expensive in most cases to solve odor problems.

(4) A great deal more research into causes and cures is desired. Some degree of dissatisfaction was expressed toward practically every well known method for industrial odor control, even though a lack of specific knowledge of these methods was indicated by many.

William W. Cook, partner in Pendray, Cook & Hoving, public relations counsel, has been a public relations executive, newspaper and magazine editor since 1935. Mr. Cook joined Pendray, Cook & Hoving's predecessor firm, Pendray & Company, in May, 1953. Prior to that he had been an account executive with the counseling firm of Hill and Knowlton, Inc., for three clients, Avco Manufacturing Corporation, the Texas Company, and California Texas Oil Company. From October, 1951, to July, 1952, he was in charge of the Hill and Knowlton office in Cincinnati, Ohio, where he directed field operations for Avco's various divisions, including Crosley, Bendix, American Kitchens, and New Idea. Before joining Hill and Knowlton, Mr. Cook was director of information for the Wool Bureau, Inc., in New York, and general manager of the Earle Ferris Company, public relations counsel. Prior to entering public relations Mr. Cook was on the city copy desk of The New York Times, and later served as executive editor of Motor Magazine. During the War, he served as a public relations officer and was discharged with the rank of captain in 1946. He was graduated in 1935 from the University of Michigan with an A.B. degree. In 1937 he entered the Graduate School of Journalism, Columbia University, from which he was graduated the following year with an M.S. degree as an alternate winner of the annual Pulitzer Traveling Scholarships.

(5) Public officials feel that enforcement is particularly difficult because of a lack of objective, scientific standards.

Specifically, results of Survey No. 1, that of industrialists, revealed the following information:

Seventy-two per cent of the respondents said they thought the air pollution situation in their plant communities had been improving in the last five years, while 20% thought it was about the same. Only 1% said it was getting worse.

An executive of Standard Oil Company of Ohio commented: "Statistics show the situation is better. However, the public is more sensitive to air pollution, so an opinion poll would probably be in disagreement with the facts."

In response to the question, "Nationally, what do you feel is principally causing air pollution?" respondents rated various sources as follows (most indicated more than one source): Industry, 57%; private dwellings, 51%; vehicles, 39%; others, 12%. Many respondents cited the Stanford Research Institute's report on smog causes in support of their answer that industry is not alone to blame.

Sixty-nine per cent of the respondents reported expenditures to control air pollution ranging from $1,700 to $20,000,000 in the last five years, while only 5% reported no expenditures.

Over one-third of the respondents, or 35%, said they thought they had solved their company's air pollution problem, and another 30% felt they had almost solved it.

Twenty-seven per cent reported plans for expenditures ranging from $50,000 to $15,000,000 over the next five years to control air pollution. The 20 companies which specified dollar estimates reported planned expenditures of $52,730,000, while an equal number of companies indicated reasonably large expenditures. Only a few said there would be no need for expenditures.

Seventy-four per cent said major consideration is given to air pollution control when their companies plan new construction. Only 8% said it was not a problem.

Opinion was almost equally divided on the question whether there should be an intensified national research program to discover the causes and cures for air pollution, with 45% saying yes, and 47% replying no.

There was far less dispute, however, on the question of whether the federal government should undertake such a program if it were to be undertaken at all, or whether industry should pool its resources to do so. Fifty-nine per cent said industry alone should undertake it; only 4% felt the federal government should do it alone, and 9% favored a joint government-industry program.

Sixty-eight per cent of the respondents felt there was no need for uniform air pollution control regulations throughout the nation, while 26% thought there was.

Forty-seven per cent favored changes in the federal income tax laws to encourage corporations to spend money to control air pollution, while 29% opposed such action.

Responses to Survey No. 2, of law enforcement officials, revealed a keen desire to know more about the causes and cures of odor and fume problems, stemming apparently from a growing public demand for more vigorous action.

Many complaints about odors, either separate from or accompanying other forms of air pollution, were reported by 78% of the respondents. More than half of these judged that complaints were increasing.

Air pollutants were rated as follows in order of importance: Smoke, airborne industrial wastes, dust, and odors.

Sixty-eight per cent said there was increasing public interest in odor problems in their communities, while 20% said there was not.

Industrial firms have found it difficult to solve their odor problems, according to 70% of the respondents. Of these, four-fifths said the firms found it expensive also. Only 30% concluded that firms have solved their odor problems easily, but of these one-third said it had been expensive.

Seventy per cent said they had sufficient legal authority to meet the problem of odors, although it is interesting to note that of these, 11% said they had requested or planned to ask for more authority. Thirteen per cent reported they did not have enough authority, but planned to ask for more.

Sixty-two per cent said they planned to intensify their enforcement efforts, while 38% did not.

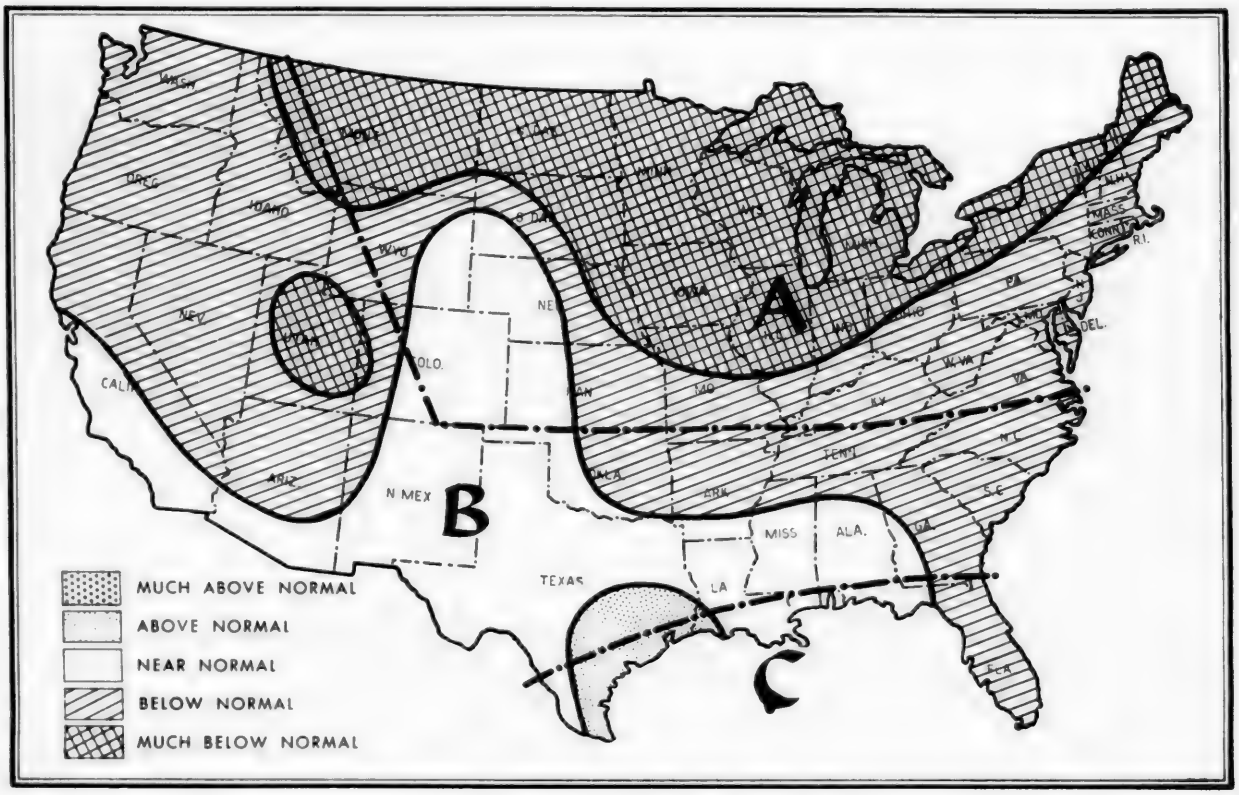
Nearly three-fourths, or 72%, said they had opportunities to make suggestions regarding odor control prior to construction of plants, while 28% said they had no such opportunity.

In order of frequency of mention, respondents cited the following sources of odors in their communities: Chemicals, 62%; vehicles, 52%; paint, and varnish, 49%; food precessing, 47%; domestic, 45%; rendering plants, 43%; plastics, 33%; oil refineries, 31%; coke works, 31%; rubber, 27%; steel, 25%; insulation, 21%; fish, 21%; gas works, 19%; pharmaceutical, 19%; soap and detergents, 17%; and breweries, 15%.

The problem of air pollution, then, is big, and getting bigger. The growing public demand for clean, odorless air is compelling industry not only to spend hundreds of millions of dollars each year to control pollutants, but to tell its story frankly and unhesitatingly across the land.

Temperature Forecast for February

Prepared for Air Conditioning, Heating and Ventilating by Long Range Weather Consultants



KEY BY REGIONS

	A	B	C
ABOVE NORMAL	+ 3° to + 5°	+ 2° to + 4°	+ 2° to + 3°
NEAR NORMAL	+ 2° to − 2°	+ 1° to − 1°	+ 1° to − 1°
BELOW NORMAL	− 3° to − 5°	− 2° to − 4°	− 2° to − 3°
MUCH BELOW NORMAL	− 6° or more	− 5° or more	− 4° or more

FEBRUARY will be a colder month than January in practically every section of the country. Temperatures will average near normal only in that section of the country lying south of a line that includes central and southern coastal California and extreme southern Arizona, then turns northward along the Divide to include most of New Mexico, Colorado, southeastern Wyoming, and western portions of Nebraska, Kansas, and Oklahoma, and thence the Gulf states from Texas eastward through Alabama. Temperatures, averaging about 2° above normal, are expected only in a limited area in southeastern Texas.

All of the rest of the country will experience average temperatures of varying degrees below the normal. Except for a small area of average temperature 5° to 6° below normal in northern Utah and extreme western Colorado, the coldest weather will occur across the northern part of the country. Temperatures much below normal, averaging 5° to 10° below the normal for the month, will occur in an area extending eastward along the Canadian border from Montana to upstate New York and extreme northern New England, dipping southward in central sections to include Iowa and northern Missouri, as well as most of Illinois, Indiana and northern Ohio. Average temperatures for the month along the Atlantic coast will range from 2° below the normal in Florida to 5° below normal north of the Mason-Dixon line.

PRODUCT APPLICATIONS

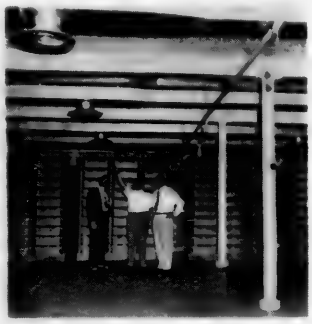
New, Unusual, or Ingenious Uses of Equipment and Materials

Conducted by WM. B. FOXHALL, Associate Editor

Air Conditioning for Chicks Clicks

PROBLEM: At New Jersey's largest hatchery in Vineland, it was found that mortality of chicks both at the hatchery and while in transit represented a sizable loss and a source of customer complaints.

SOLUTION: A 15-ton Chrysler Airtemp packaged air conditioner was installed in the holding room where chicks are kept just prior to being shipped. Overhead diffusers were used to minimize drafts. A steam coil in the air conditioner also provides for tempering of outside air in the winter. Outside air must be circulated at all times because the baby chicks must have the right amount of oxygen. A double bank of filters was installed to remove quantities of chick fuzz from the air by daily cleaning.



RESULTS: Chick losses from overheating are now at an all time low, and losses in transportation are much less because chicks are found to be stronger when leaving the constant temperature holding room. Chicks in cartons can now be stacked approximately twice as high as formerly, giving the holding room increased capacity. Cleanliness and working conditions are improved.

Potato Chip Factory Air Cooled

PROBLEM: The H. W. Lay Co., a large producer of potato chips and other food specialties, was facing difficult storage and working environment problems in its main plant in Atlanta, Ga.

SOLUTION: An air conditioning system was installed in packaging areas, potato storage and nut storage areas and in the company's offices. Two hundred and fifty-four tons of refrigeration are produced by a Trane centrifugal compressor serving an automatic chilled water system. Water at 40 deg F is circulated to air handling units in the conditioned areas, each of which will have separate control of temperature and humidity. The compressor will automatically adjust its output to the load as determined by the controls. Separate Trane reciprocating compressors will provide cooling for nut and bacon rind storage spaces.

RESULTS: Improved productivity of comfortable employees and improved quality of product due to temperature and humidity control in raw material storage areas are the benefits counted among advantages of air conditioning.

Steam Generator Cuts Fuel Bill

PROBLEM: Paramount Cleansers and Launderers, Inc. of Lowell, Mass., was facing bills which the management considered to be excessive.

SOLUTION: A new steam generator, Steam-Pak, product of York-Shipley, Inc., was installed to provide 100 hp of high pressure steam for dry cleaning and laundry work. The burner is designed to burn both No. 5 oil and gas.

RESULTS: The saving in six months on fuel costs alone amounted to 48%. Insulation on the steam generator is such that the boiler room is the coolest spot in the plant which is fully air conditioned. Use of the steam generator with combination firing makes it possible to burn whichever fuel is most economical.

Insulated Storage Saves Pecans

PROBLEM: With a seasonal crop such as pecans, safe storage plays an increasingly important role. Since there is a tendency toward bumper crops of pecans one year and short crops the next, it is important to have adequate cold storage to carry over some of the production from one year to the next. To meet this situation, the R. E. Funsten Company of St. Louis, Mo., the largest pecan processors in the nation, needed warehousing space in Albany, Georgia. The firm leased a four-story brick warehouse which had to be converted to cold storage purposes.

SOLUTION: Parts of the second and third floors were insulated with Foamglas. After covering the floors with four inches of Foamglas, a wearing surface of three inches of concrete was applied. The walls were covered with two layers each of two-inch Foamglas.

RESULTS: The storage area is maintained at a constant temperature ranging between 34 and 36 deg F in spite of the wide range in the Georgia weather. Light weight of the insulation places no strain on the structural members of the building. High quality of the stored product is maintained for best marketing time.

Perimeter Heating Saves Excavation Cost

PROBLEM: Franklin Park Apartments, Philadelphia, added a complete new garden apartment building to the existing two buildings. The corner lot on which the new building was erected consisted of solid rock. To construct a basement boiler room supplying a system of convectors in each apartment would have required not only costly excavation through rock but also pipe trenches built under the slab.
SOLUTION: The need for pipe trenches was eliminated by using continuous loops of Webster Walvector in perimeter installation. The prohibitive cost of a boiler room hewn out of the solid rock was avoided by enlarging the boiler room that served the two older buildings. Although that boiler room is about a half block away from the building to be heated, the arrangement is both economical and satisfactory. A new boiler was added, and hot water to heat the new building is now pumped from the heat exchanger to the header station in the ground floor of the building. From there it is re-pumped by additional circulators throughout the three zones of the apartment building. Two of these zones, serving the apartments, are under Webster Continuous Flow Control. The third zone supplies constant circulation to Webster Down-Blow Unit Heaters in five stores on the ground floor of the building.
RESULTS: Edward R. Sabin Company, heating contractor, reports that there was a clear saving of $30,000 on the original estimate, by saving the cost of excavation and pipe trenches. Since the two steam boilers are cross-connected, the domestic coils in the new boiler will, in an emergency, take care of the entire domestic hot water needs of all three buildings, which contain a total of 161 apartments. If the original boiler should break down, the new one could supply enough heat to prevent serious complaint anywhere in the three buildings. On a trial run, prior to the start of the 1955-56 heating season, owners report prompt heat response in all radiators.

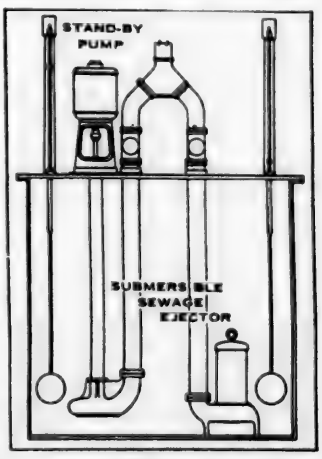
Radiant-Acoustical Ceiling Promotes Comfort

PROBLEM: For large offices in a new toll building in White Plains, N. Y., American Telephone and Telegraph Co. required wide-area heating and cooling with closely controlled humidity. Specifications also called for acoustical treatment and recessed lighting.
SOLUTION: Architect-engineers Lorimer and Rose of New York City specified a Simplex radiant - acoustical ceiling, made by the Simplex Ceiling Corp., New York City to cover over 120,000 sq ft of office space in the building. This is a hung ceiling of perforated aluminum acoustical pans which are modular with lighting troffers. Air ducts are integrated with the ceiling so that the duct bottoms form part of the surface of the ceiling. Duct tops are made of highly reflective aluminum and may therefore be left uninsulated. Duct bottoms are made of anodized aluminum for its greater radiant effect. The ceiling ducts, on three- to six-foot centers depending on zoning, are supplied by insulated mains which traverse the plenum above the ceiling. Air is supplied to the room through perforated panels at the ends of duct runs. It is returned via the plenum space above the ceiling, entering it through special slots provided at the perimeter. A central heating and cooling system controls temperature and humidity of the air. Areas of the ceiling not taken up with ducts or lights, approximately 65%, are standard, square edged, perforated, acoustical panels with an anodized finish. The acoustic pads placed on them are rock wool in flameproof envelopes.

RESULTS: A single continuous ceiling surface provides acoustical treatment, lighting, heating, cooling, ventilating and humidity control. Much of the heating and cooling load is handled by radiation to and from the ceiling while the heating or cooling cycle is completed convectively by the air when it enters the room. Because air enters the ceiling ducts at greater than normal temperature differentials (30 degrees on cooling, up to 70 degrees on heating) from 40% to 60% less air is used than in straight air systems. Air enters room areas at low velocities, without drafts, and assures minimum lag on either heating or cooling cycle. Ceiling and heating distribution systems are installed by a single trade making for a more responsible and economical installation.

Submersible Pump Handles Theater Sewage

PROBLEM: Quantities of rags and bulky paper products periodically clogged the sewage pumps serving the Rockne Theater in Chicago. A wire screen installed directly under the inlet to the pump was ineffective because employees neglected to clean the screen at regular intervals.



SOLUTION: A submersible sewage pump with a bladeless impelled especially designed to handle rags and stringy material, manufactured by Weil Pump Co. of Chicago, was installed to replace one of two original pumps powered by 5 hp motors. The new pump is a 3 inch submersible sewage ejector powered by a 1 hp motor, and the remaining 5 hp pump is maintained as a standby. The screen was removed entirely.
RESULTS: According to the theater management, the new pump has been successfully operating since the summer of 1951 and has never clogged. No attention to this motor has been required. Special seals, cooling arrangements, and bearings have combined to give the pump a life expectancy which has never been exceeded in the field.

What Would You Do?

Replies to engineering and operating problems of interest to the industrial plant engineer

Conducted by
NATHAN N. WOLPERT
Associate Editor

AN interesting problem relating to the cleaning of cooler tubes, fouled by muck and oil in river water used for cooling, is presented in this issue. Two sides of an important maintenance problem are considered.

Should you have a problem that you would like to see treated in this department, or if you have some comments that you would like to add to the discussion scheduled for the next issue, you are invited to write to the Editor.

This Month's Problem

To reduce the moisture in compressed air lines, we have compressor inter and after coolers. We have a number of compressors located in various parts of the plant. River water is used for the coolers and the cooler tubes get fouled up from the floating oil and muck in the river water. Are there water filters for use in these widely separated points in the plant that can reduce the number of tube cleanings? Is the maintenance of these filters cheaper than pulling out the tube nests, cleaning and then replacing them? What other benefits would follow the use of such filters?

Discussion of the Problem

Filters may be employed to correct the difficulties encountered in the particular system. The filters that could be used are:

1. Diatonaceous earth filters.
2. Regular vertical pressure filters employing sand and gravel or anthrafilt as the filter medium.

In diatonaceous earth filtration, a permeable base or septum is required to support the diatonaceous earth filter cake. The septum must prevent the passage of the filter aid, but must be permeable to the flow of filtered water. It must be of sufficient strength to withstand the pressure drop. Among the materials used as a supporting base are filter cloths, porous stone tubes, wire screens, wire-wound tubes and porous filter pads. The supporting medium is first coated with a slurry of diatonaceous earth which then acts as the filter medium. The water is filtered in passing through the diatonaceous earth coating. When a high pressure drop develops, due to the accumulation of suspended matter removed in filtration, the filter coating is sloughed off by back wash and the filter returned to service, after pre-coating. Coagulants, with the necessary pH control involved, are not required.

Most filter manufacturers can supply diatonaceous earth filtration equipment. The Stellar filter is handled by Infilco, Inc. This company also handles larger filters of this type. These units are efficient in a relatively small size, and could be located on lines carrying river water to the various units to be cooled.

The second general type of filter would be the regular vertical pressure filter. If such a unit, sand gravel or anthrafilt could be employed as the medium. With this type filter, it would be necessary to employ a coagulant, such as an iron or aluminum salt, together with an alkali to increase the pH and to precipitate the ferric hydroxide or aluminum hydroxide. Oil would be absorbed on the precipitated ferric hydroxide or aluminum hydroxide, and operation of such a filter would be in the normal fashion.

There is no doubt that the use of filters at widely separated points in the plant could reduce the number of tube cleanings. However, it would be difficult to say whether this operation would be less expensive than the present regular maintenance of the equipment. The use of the filters, however, would provide for more or less trouble-free operation of the equipment from the standpoint of cooling.

In addition to the company mentioned, there are other manufacturers who could supply suitable equipment for the purpose intended. These include:

American Water Softener Co., 4th St. and Lehigh Ave., Philadelphia, Pa.

Cochrane Corp., 16th St. and Allegheny Ave., Philadelphia 32, Pa.

Graver Water Conditioning Co., 216 W. 14th St., New York 11, N. Y.

The Permutit Co., 330 W. 42nd St., New York 36, N. Y.

Richard B. Conlan
W. H. & L. D. Betz
Philadelphia, Pa.

The oil-bearing water, which in this case exists as a mechanical mixture of oil and water rather than an emulsion, may be passed through some form of coarse filter media such as burlap, cloth, excelsior or coke. This material will allow passage of the water but will retain

Problem for the Coming Issue

Because of the increase in motor costs, it is most important to us that the motors be properly protected against overload. Without becoming too involved in power principles, what is required for motor protection for both integral and fractional horsepower motors?

the oil. If the problem was the removal of oil alone it would be safe to say at least a partial relief from the oil problem could be expected by utilizing one of the above filters.

Unfortunately, it is necessary to contend with not only oil but suspended solids in the river water probably made up in the most part by silt, clay and organic matter. Not only will the oil be retained by the filter under these conditions but much of the suspended matter will be caught in these semi-porous filters. The filters will soon clog requiring frequent replacing, or an increased head pressure, to allow passage of the water.

A clean, clear water could be obtained by the use of a treating system involving chemical coagulation followed by filtration. However, the installation and operating cost of such treatment would not make it feasible when compared to the cost of pulling tube nests, cleaning, and replacing them.

However, if the river water is used elsewhere in the plant, it may be safe to assume this supply is fully or at least partially treated to remove the objectionable oil and suspended matter. It might be well to investigate the possibility of obtaining a portion of this treated water for the inter and aftercoolers particularly if a use can be found for the outlet water from the coolers.

Not knowing the number of compressors involved or the number of times per year the tube nests must be cleaned, makes it difficult to estimate the least expensive way to solve this problem.

Possibly it might be wise to obtain several of the semi-porous filters for trial runs on this water. It could then be determined how long each filter would last, the cost of removing and replacing it in the line, and the replacement cost. A total for the year could then be calculated and checked against the cost of cleaning the tubes.

Benefits that accrue from the use of a clear water include, lessening of the possibility of plugging of tubes and overheating due to caking of a mixture of solids and oil on the tube surfaces; tube surfaces are exposed to action of corrosion inhibitors if added; elimination of majority of costly tube maintenance, better heat transfer, and more efficient operation of the compressor with the same amount of water.

Incidentally, a reduction of moisture in the compressed air lines could be obtained by the use of a closed cooling cycle for the inter and after cooler water. Not only would a greater percentage of moisture be removed but also there would be little or no problem of tube maintenance, as the same clear water would be recirculated for cooling purposes.

P. G. G. Delahunt
Worthington Corporation
AC&R Division

Harrison, N. J.

The removal of suspended matter from the river water will certainly pay for itself in reduction of maintenance of the cooler tubes. The filtration of water for removal of suspended matter is an economical process and requires only a little alum from an alum feeder ahead of some pressure filter to produce a clear water which will prevent fouling of the cooler tubes.

This assumes that the river water does not have too much hardness in it and that the temperature rise through the cooler tubes will not precipitate any hardness. We would suggest that the deposit in the cooler tubes be analyzed to see whether it is mainly the suspended clay and silt in the river or whether it also contains hardness. If hardness is precipitated by the heating effect, then a softener would be justified.

If the amount of suspended matter and silt in the river water is very high, then some settling tank or a solids contact reactor would be justified ahead of the filters so that the filters would not have to be backwashed too often. Ordinarily filters should be washed not oftener than once a day and the amount of suspended matter which filters usually handle is under 100 ppm (parts per million). If the river water contains much more than this, settling prior to filtration is justified.

Rather than have a number of individual small filters throughout a large plant where cooling operations take place, it would be advisable to have a centralized water treatment plant for the whole cooling system and thereby remove the suspended matter at one point where the installation can be more economically installed and operated. Then clean water would be circulated to all the coolers to keep them free from fouling.

S. B. Applebaum,
Director, Water Treatment Division,
Cochrane Corp.

Philadelphia, Pa.

The following comments are in answer to the problem discussed in the previous issue. The problem is based on the most satisfactory method for welding stainless steel pipe in the field.

Stainless steel fittings are normally furnished with a standard 37½ deg bevel end preparation. Butt welding fittings and pipe prepared in this manner are suitable for welding with manual metal arc and inert gas tungsten arc welding. Inert gas, consumable electrode welding may also be used on larger diameter sizes.

Under ordinary circumstances the metal arc process using coated electrodes is the most economical method in field welding. Initial equipment cost is less and the process is somewhat faster than inert gas tungsten arc welding. The major problem in producing good welds with the metal arc process lies in the fit up of the joint. Arc welders accustomed to welding have some difficulty at the start in obtaining good penetration on the root bead with the "lime type" or "low hydrogen" stainless electrodes. Therefore, it is most important to use care in obtaining correct alignment of the mating pipe or fitting ends and also in providing a uniform root opening of adequate spacing. Root opening is a function of the welding procedure specification and as such must be controlled. It will be found that in the course of making the root bead, the joint tends to close up more than with carbon steel, due to the greater shrinkage of stainless steel. Sometimes it is possible to remedy this condition by fitting the joint with a greater root opening on one side than on the other. The weld is started at the point of closest spacing, and shrinkage closes the wider opening to the correct spacing as the weld progresses.

The AC-DC type electrodes (lime-tetania) may be preferred over the DC type (lime coated) due to smoother performance of the electrode, better side wall wash, and easier slag removal. However, if cracking troubles are

encountered or anticipated, the DC type electrode should be used. Crater cracking is a common difficulty in welding stainless steel and is more prevalent with the AC-DC electrodes.

In field erection, particularly where the work is subjected to the weather, care must be taken to protect the stainless electrodes from the damaging effects of moisture. The electrode coatings are hygroscopic, and therefore must be kept in dry locations. Use of electrode drying ovens or placement in heated storerooms is recommended.

In work of exacting nature where the conventional metal arc process does not produce the desired results, inert gas tungsten arc welding may be advantageous. Such a case may be where specifications require a smooth inside weld bead contour, free from the normal weld metal protrusions or pockets on the underside of the root bead. Welds meeting these requirements can be made by either of two techniques with the stated process. The first method employs standard bevel end preparations and requires that the joint be fitted tight, with no root opening. The root bead is made by fusing the mating lands together with the inert gas tungsten arc torch. For this weld it is necessary to "purge" the inside of the weld joint with an inert or inactive gas to exclude air.

Contamination of the weld metal by exposure to the atmosphere on the underside of the joint results in severe oxidation and quite likely cracking in the weld. After completion of the root bead, the weld can be finished by inert gas tungsten arc welding (with addition of bare weld rod) or by metal arc welding.

The other inert gas tungsten arc method requires special bevel preparation to very exacting tolerances and employs a consumable backing ring or weld insert. In the process of fusing the pipe lands together when making the root bead, the weld insert fuses completely into the weld and the inside surface of the pipe. The advantage of using this techniques lies in less skill required on the part of the operator. Also, very smooth inside surfaces can be obtained with greater consistency than without use of the insert. Purging of the inside of the joint is also required.

To summarize, good quality welds can be economically produced in field welding of stainless steel pipe by manual metal arc welding.

W. Root,
Welding Engineer,
Taylor Forge & Pipe Works
Chicago, Ill.

Additional Underwindow Fan-Coil-Filter Unit for Air Conditioning

In an article, "Underwindow Fan-Coil-Filter Units for Year-Round Air Conditioning," by Gayle B. Priester in the December 1955 issue of AIR CONDITIONING, HEATING AND VENTILATING, Young Radiator Company was inadvertently omitted from the review as a manufacturer of available equipment of this type. Data have been received from the Young Radiator Company, and are tabulated so as to be comparable with those published for other manufacturers in Table 1 in the original article in the December issue.

Figure 14 shows a picture of the Young Radiator Company Roomaire Unit with the front cover removed. With this unit in operation, as in most other units, air is drawn in through the lower grille, passed through the filters, drawn into the fans, blown over the coil, and discharged into the room. This figure number continues the figure number of the article.

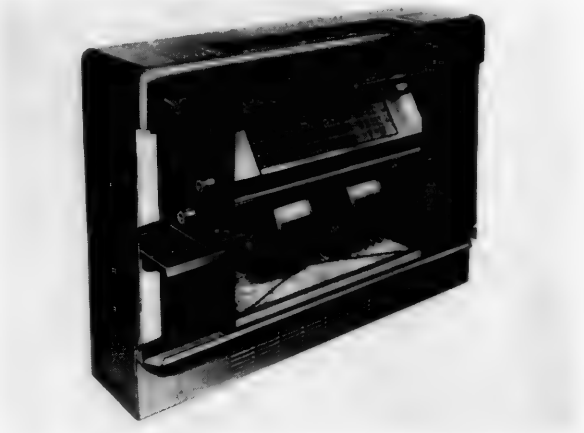


Fig. 14. Type FW Roomaire made by Young Radiator Co.

Make	Model No.	Free Standing Units			Supply Grille	Cooling Capacity[a]	Sensible Heat Ratio[a]	Heating Capacity[b]	Cfm		Coil Tubes		
		Width, Inches	Height, Inches	Depth, Inches					High	Low	O. D., Inches	Material	No. of Rows
Young Radiator	AC-2FW	36	25	9¼	Top and front; fixedva.	5,520	0.80	14,280	200	103	⅜	Red brass	4
	AC-4FW	51	25	9¼		12,250	0.80	31,600	400	207	⅜		4
	AC-6FW	66	25	9¼		18,370	0.80	48,000	600	310	⅜		4

No. of Face Tubes	Coil			Fans			Fan Motor		Cabinet	Filter
	Face Area, Sq Ft	Fin Spacing, per In.	Fin Material	No.	Max. rpm	No. of Speeds	Hp	Type	Material, Finish and Insulation	
9	0.99	8	Alum.	1	1550	4	1/35	Shaded pole	18 ga. steel; baked on grey enamel; ½ in. glass insulation	1 in. cleanable
9	1.98	8	Alum.	2	1550	4	1/15			
9	2.97	8	Alum.	2	1550	4	1/12			

a. Btu per hr at 80 deg db, 67 deg wb, 1 gpm of 45 deg water per 100 cfm at high fan speed.
b. Btu per hr at 70 deg db, 1 gpm of 180 deg water per 100 cfm at high fan speed.

NEWS OF EQUIPMENT AND MATERIALS

Use the convenient prepaid postcard appearing on page 155 for securing additional information on new equipment and materials described in this department.

Winter Air Conditioners

A line of furnaces, named Weathermaker, which are adaptable to year-round air conditioning, is introduced by Carrier Corp., Syracuse, N. Y.

Vertical models of the furnace are available with a matching plenum on top that serves as a section of duct.

In adapting the units to year-round air conditioning, the dealer lifts a removable front cover on the plenum, slips in a cooling and dehumidifying coil, and connects it to an air-cooled condensing unit outside the house or in the garage.

The vertical model is 4½ ft high and 28 in. deep. Its width varies from slightly more than 2½ ft down to 14 in. Because of its size, the furnace may be installed in an alcove, closet, basement or utility room with no sacrifice of floor space.

Complete line of upflow, counterflow (illustrated), and horizontal units is approved by the American Gas Association for use with all gases at capacities ranging from 75,000 to 231,000 Btu per hr. Similar units are also provided in oil-fired models.

More information? Circle Item 1 on postcard, page 155.

Maximum Pressure Gage

A maximum pressure gage named the Serviceman has been developed by Jas. P. Marsh Corp., Skokie, Ill.

The gage is designed to relieve the serviceman of constant gage watching and to give visual proof of maximum pressure reached over a given period of time. By means of a check valve, the pressure applied is trapped inside the Bourdon tube, and the indicating hand is stopped on the dial at the point of maximum pressure. The pointer may be returned to zero by pressing the push button on the side of the gage socket, thereby releasing the pressure.

The gage is standard with a polished brass case and ring, a glass crystal, a 2½-in. dial, a ⅛-in. male bottom connection, and the company's Recalibrator. Its standard dial range is 0 to 400 psi.

Among the uses of the gage are checking commercial cold boxes, auto air conditioning systems, balancing refrigeration systems, and in checking industrial processes and systems where maximum pressures are important.

More information? Circle Item 2 on postcard, page 155.

Air Diffuser Is Restyled

Overall dimensions of the recently restyled Kno-Draft residential ceiling air diffuser have been reduced and its contours sharpened by Connor Engineering Corp., Danbury, Conn.

Capacity range has been increased to more than 750 cfm with the addition of a 10- and 12-in. diffuser, making the units suitable for small stores, offices, and larger homes.

Installation has been made simpler inasmuch as the diffuser collar now fits inside round ducts instead of outside, as formerly. A sponge rubber gasket provides a positive air seal.

More information? Circle Item 3 on postcard, page 155.

Tool Clears Clogged Pipes

The hydraulic water ram, a maintenance tool used for cleaning clogged drain pipes and sewers, has been improved by The Hydraulic Mfg. Co., Kiel, Wis.

Changes to the tool include the addition of a pistol grip, for added convenience in holding the ram to the various drains and plumbing fixtures with which it is used. The ram is also equipped with a spring linkage between the trigger and release valve. The trigger discharge permits almost instantaneous discharge of the compressed air slug in order to sharpen the impact against sewer or drainpipe obstructions where heavier charges of compressed air must be used. The ram operates on hydrostatic power, not pressure.

Using a self-contained pump plunger, the operator compresses the air in the ram chamber to approximately 60 to 80 lb as required. The sudden release of this slug of compressed air, striking a solid water column against the obstruction in the pipe, delivers a split-second impact which clears the drain block.

The ram imparts a nearly constant impact through a column of water against obstructions. This effect is comparable to that seen when a spike is given a sharp blow with a hammer, driving it through hard wood. The transmission of the ram impact is sufficiently fast that less than 2% of it is dissipated against the side walls of the pipe. Ninety-eight percent of the energy is used directly against the obstruction.

The ram is suited as a maintenance tool for plants or any sizable building, regardless of classification wherever sluggish or blocked drain lines or sewers occur.

More information? Circle Item 4 on postcard, page 155.

Insulation for Homes

Insulation for homes is a new product of L.O.F Glass Fibers Co., Toledo, Ohio. The insulation is made of light density, fine glass fibers having an aluminum reflective vapor barrier on one side with tabs extending beyond the edges of the insulation for nailing or stapling to framing members.

Packaged four rolls to a bag to facilitate handling, storage, and application, the insulation weighs from one to two ounces per running foot. It comes in three thicknesses—standard, medium, and full-thick—which are based upon the effective utilization of the space that exists between studs and joists in standard wood frame constructions. It is made in widths to fit framing members, studs, and joists that are typically spaced 16 in. on centers and also made to accommodate 20- and 24-in. spacings that have more limited use.

The tabs are flush with the interior edge of joists or studs to provide an air space between the interior finish and the foil. The reflective foil not only serves as a vapor barrier but also as insulation because it's bright surface absorbs and emits very little radiant heat.

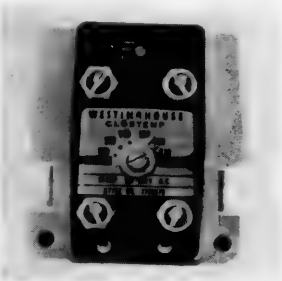
The foil is applied to only one side of the insulation to permit it to "breathe" toward the outside. A second facing is not needed to hold the insulation in place since it is sufficiently light in weight to support itself.

More information? Circle Item 5 on postcard, page 155.

Water Heater Thermostat

A water heater thermostat called Clostemp is available from Westinghouse Electric Corp., Pittsburgh, Pa. Accelerated tests were made which showed that the thermostat can maintain water temperature to within 3 deg F of original calibration after 50,000 operation cycles.

To assure the quickest possible response to tank wall temperature changes, the bi-metal assembly has been placed on the outside of the thermostat back plate. Contact and other current carrying parts that are sensitive to dust and dirt, are protected within an aluminum and molded phenolic case. Over-all dimensions of case are 2⅜ x 2⅞ x 1⅜ in.



Other features of the thermostat include a reflective dial with positive dial stops to prevent setting above a safe limit. The temperature range is adjustable from 120 to 170 deg. An *off* switch at the extreme low end of the temperature range permits circuit testing during equipment assembly.

Universal mounting—either snap-on or pad type—is made possible by the design of the mounting plate. This applies to units with either wrap-around or immersion type heating elements.

In addition to water heater application, the thermostat is suitable for use in dishwashers, steam tables, and laundry, laboratory and dairy equipment.

More information? Circle Item 6 on postcard, page 155.

Small Trenching Machine

A small trencher, called Ditch-Witch, is made for light trenching by The Charles Machine Works, Perry, Okla.

Automatically propelled forward, the trencher can dig either a 4½- or 6-in. bucket line to a depth of 30 in. and has an hydraulic depth control. A hand pump raises the boom from the trench for traveling. Digging speeds to 3½ fpm are obtained by varying the number of teeth engaged on a ratchet wheel attached to the driving wheel. The operator has the option of feeding the machine either by hand or power.

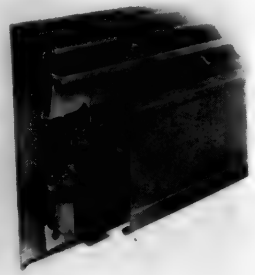
A vertical boom enables the trencher to dig right up to foundations, curbs or other level obstacles. The trench may be started less than 10 in. from a wall or foundation.

Mounted on rubber tires, the trencher may be loaded into a pickup truck or small two-wheel trailer under its own power.

More information? Circle Item 7 on postcard, page 155.

Perimeter Heating Units

A line of baseboard radiation, known as Aire Base, for forced hot water heating systems is available from Standard Fin Pipe Radiator Corp., Clinton, Mass.



Furnished in a gray, zinc-coated finish, the baseboard can be painted any color to blend with interior color schemes and improve the appearance of a room. It is designed for either flush or recessed installation; enclosures are 9½ in. high and extend 2¼ to 3 in. into the room, depending upon whether or not a flush or recessed installation is used.

By removing the front cover plate, which can be snapped off, all parts are accessible for cleaning with an ordinary household vacuum cleaner.

For individual room comfort control, the unit has a finger tip damper control which permits the reduction or shutting off of heat in any room desired. The baseboard uses a radiation element consisting of aluminum fins on copper tubing. The radiation element is supported on sliding double cradle hangers, which permit expansion of the element without making noise.

The baseboard is packaged in corrugated cartons, with each package holding a complete unit assembly in 4, 5, or 6-ft lengths. The carton contains the backing plate, cradle hangers, brackets, damper cover plate, joining piece, and radiation element.

More information? Circle Item 8 on postcard, page 155.

Redesigned Packaged Units

The entire 1956 line of Airtemp waterless and water-cooled packaged air conditioners has been redesigned by Airtemp Div., Chrysler Corp., Dayton, Ohio.

As pictured (unit shown is Model 1008-2, a water-cooled packaged air conditioner), the flush design is based upon the simplicity of modern functional styling.

Finished in a neutral spatter, gray enamel, all the packaged conditioners, in sizes from 2 to 30 hp, will be available in the Forward Look cabinet.

The refrigeration system of the air conditioners carries a five-year warranty against failure in operation due to manufacturing defects. The warranty includes the compressor, condenser, evaporator, expansion valve, shutoff valves, flexible connections, and fusible union or relief valve. For the five years, the company will replace any part found to be defective and in doing so also provide both freight and labor allowance.

An eight-page booklet (L-241) illustrating the new air conditioners is issued by the company.

More information? Circle Item 9 on postcard, page 155.

Pneumatic Switching Valve

A switching valve for use with dual pressure, pneumatic control systems is offered by Johnson Service Co., Milwaukee, Wis.

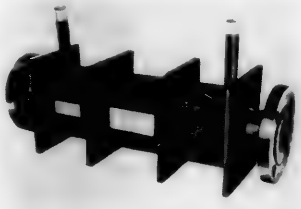
Designated V-132, the pneumatic switching valve is supplied with a universal bracket for mounting in any position.

An exhausting 3-way valve, it will switch automatically on a dual supply pressure change, eliminating the need for a separate air line from a central station to accomplish the switching. When used for unit ventilator control, it reduces installation time and eliminates the need for a second, pressure-electric switch and a solenoid air valve. The three pipe connections are normally-open, normally-closed, and common.

More information? Circle Item 10 on postcard, page 155.

Gas Flow Element

A gas flow element, called Model 10 Vol-O-Flo, that is based on the principle of the linear pressure drop set up by the viscous flow of fluids in thin channels is available from National Instrument Laboratories, Inc., Riverdale, Md. The flow element is a rigid metal unit that is arranged to provide a multiplicity of flow channels in which the Reynolds number is kept below 400 at full scale flow. Pressure taps are provided to permit coupling a manometer or differential pressure gage to read the indicated pressure.



The viscous flow element develops a differential pressure indication linearly proportional to the volumetric flow. A low Reynolds number insures that the flow in the element will be insensitive to upstream disturbances, and the unit may be piped close to a valve or bend without affecting the calibration. The linearity of the element also guarantees that the flow meter will develop a true average flow indication for a pulsating flow input.

Standard flow ranges of the element are from 0.003 to 100 cfm for steam and most of the common gases at pressures from 1 inch of mercury absolute to 2000 psig. Pipe threaded or flange mounted units are available, as are manometers and dial gages for indicating differential pressure.

More information? Circle Item 11 on postcard, page 155.

Bath Tub for Large Projects

A bath tub unit has been designed as an economy fixture for modern, large scale housing developments by Chicago Pottery Co., Chicago, Ill.

Called the Wellington, the unit is a straight front, steel tub with an acid resisting, porcelain enamel finish. A feature of the tub is the undercoating which is applied to deaden sound when the tub is in use.

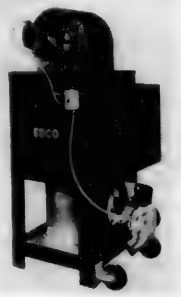
Available in both left and right hand models, the tub is made in five decorator colors and white. It measures 5 ft by 29 in., is 16 in. in height, and has a 14-in. sump.

More information? Circle Item 12 on postcard, page 155.

Portable Oil-Fired Heater

A portable, oil-fired heater for indoor or outdoor use is distributed by Cauhorn Distributing Co., Detroit, Mich.

Designed to heat men at work in exposed or partially exposed areas, the heater is recommended for warehouses, repair shops, construction jobs, thawing, drying, and other uses. It is self-contained and can be rolled on its own wheels by one man.



Operating on kerosene or No. 1 fuel oil, the heater can produce up to 190,000 Btu per hr. No installation vent, flue, or chimney is required because of the heater's combustion efficiency. The heater draws 110-115v, a-c current.

A blower on the top of the heater draws in air and forces it down and over a heat exchanger where it is blown out through openings in three of the lower sides. The heated air is circulated directly to the feet, legs, and body zone of the work area.

Equipped with standard UL-approved oil burner, motors, and parts, the heater can be serviced by any competent, oil-burner serviceman.

More information? Circle Item 13 on postcard, page 155.

Recessed Wall Fountain

A fully recessed, stainless steel wall fountain named Indestruct is being produced by Filtrine, Inc., Brooklyn, N. Y.

Modelled in classic lines to enhance the finish of the heavy-gage, No. 304 stainless steel, the wall fountain is protected against chipping, cracking, and wear in severe service areas. Its interiors corners are molded to facilitate maintenance. The bottom is pitched and swedged to accelerate drainage, and the underside is insulated against condensation.

The fountain is furnished with flow-controlled sanitary bubblers and a push-back glass filler. Convenient, front access to the bubbler valves, pressure control, and loose-key stop is provided on a recessed, seamless panel

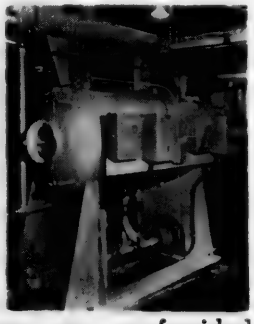
Literature, specifications, and rough-in drawings are published by the company.

More information? Circle Item 14 on postcard, page 155.

Packaged Boiler Return System

A packaged boiler return system has been designed by The Patterson-Kelley Co., Inc., East Stroudsburg, Pa., to utilize heat energy from high pressure condensate to preheat incoming water for processing. The packaged unit also reheats condensate and make-up water to near steaming temperature and returns it to the boiler.

Comprising a condensate cooler and receiver, feedwater heater, and controls, pumps, piping, and accessories, the unit comes completely packaged, ready to be set up and piped to steam, condensate and water lines. The condensate cooler is an integral part of the condensate receiver. The closed boiler feedwater heater is mounted atop the receiver. Accessories, including steam trap, strainers, gate, check and quick-vent valves, thermometers and pressure gage, are furnished completely assembled. Piping and power connections are all that are required before starting the operation of the packaged system.



Capacities of the boiler return systems vary with the size. A 250-hp unit, for example, can cool 8650 lb per hr of high pressure condensate from 300 to 190 deg F, using 5050 gph of water at 100 deg. Effective heat transfer surface in the cooler is 88.5 sq ft. The feedwater heater of this unit can heat 51 gpm of water from 190 to 290 deg with steam at 100 psig. Its heat transfer surface is 35.5 sq ft. The packaged systems are being made in 11 sizes, ranging from 30 to 300 boiler horsepower. Larger capacities are also available.

Dual or single pump operation is possible. The two-stage boiler-feed pump is designed to operate intermittently, feeding for 1 min and then idling for 2 min. The pump can operate at capacity against a 305-ft head. Pumps for the 250-hp unit are 7½-hp and operate at 3490 rpm. They use 220-v., 3-phase, 60-cycle current and are actuated by remote boiler water level controls.

More information? Circle Item 15 on postcard, page 155.

Swing Check Valves

Y-pattern swing check valves are being produced by Northern Indiana Brass Co., Elkhart, Ind. Both solder and threaded end styles are produced in 125 and 150 lb static water pressure ratings and in sizes from ⅜ to 2 in. The 125-lb valves are furnished with brass discs, and the 150-lb valves are furnished with composition steam discs.

The Y-pattern design permits direct access to the flapper and disc assembly, providing for maintenance without removing the valves from the line. It also insures positive closure the instant the flow is interrupted.

More information? Circle Item 16 on postcard, page 155.

7½-Amp Room Air Conditioner

A 7½-amp room air conditioner, which needs no special appliance circuit and can be plugged into any convenient outlet, is introduced by Fedders-Quigan Corp., Maspeth, N. Y., along with over fifteen other models which make up the manufacturer's 1956 line.

Called the Supreme, the 7½-amp unit is in the company's ¾-ton series. It draws slightly more current than a home refrigerator but has the same cooling capacity of comparable 12-amp room air conditioners. A company designed compressor, which provides a high pumping rate at low current output, is the heart of the new model. Another feature of the unit is its low starting current requirement. The lower surge is particularly significant when installations are made in old underwired buildings, where the higher starting amperage requirements may blow fuses.

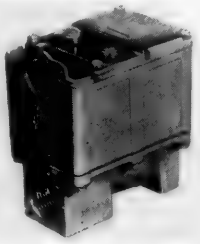
The unit is equipped with an automatic thermostat, 2-speed fan motor, 6-position push button switch, and is custom trimmed.

The 1956 line consists of Custom and Deluxe models in series ½, ¾, 1½, and 2-ton series. In addition, there are casement units in the ½ and ¾-ton series, and the Decorator Consolette, an enclosed room unit which can be installed free-standing, on the floor, or recessed into the wall.

More information? Circle Item 17 on postcard, page 155.

Gas Valve Has Silencer

A gas valve with its moving parts cushioned in oil to quiet their operation has been developed by Minneapolis-Honeywell Regulator Co., Minneapolis, Minn.



Known as V-80, the valve has a sealed, oil-filled powerhead which contains a magnetic operator to provide the motivating force. A controlled viscosity oil dampens the plunger stroke in much the same manner as an hydraulic shock absorber. This makes the valve suitable for homes where quiet heating equipment is needed for installations near living rooms or sleeping quarters.

The valve requires no bleed lines or bleed burners. Its terminal connections meet the Supplementary Utilities Requirements ban against breaking soldered wiring connections to remove a control valve.

The valve disc is coupled and spring-loaded to the valve disc arm to provide floating action. It is self-aligning and provides equalized pressure on the valve seat. The floating disc makes it possible to mount the valve in any position in a complete circle about a horizontal pipe line. The disc has a compression ridge at its outer edge for tight closure.

The valve seat is at a 45-deg angle to permit straight-line gas flow and reduce the possibility of foreign materials lodging on it.

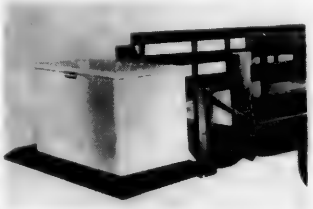
Available in all standard sizes (the ¾-in. is illustrated), models of the valve are approved by UL and AGA. The unit may be supplied with a conduit cover, manual opener, and other optional features as desired.

More information? Circle Item 18 on postcard, page 155.

Tail-Gate Lifts 1100 Lb

An 1100-lb capacity power-lift tail-gate for use with pick-up, stake, or platform truck bodies is announced by Hercules Steel Products Co., Galion, Ohio.

Known as the Model H-11 series Load-N-Gate, the lift is suitable for use on ½- to 1-ton trucks. It is available both in electrically driven and power take-off types. Models H-11E (6-v) and H-11E-12 (12-v), electrically powered by the truck battery, are for use on trucks without transmission power take-off openings. Model H-11 (illustrated) is powered by the truck engine through a conventional power take-off drive.



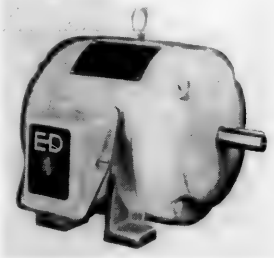
Two hydraulic cylinders, controlled by a single lever at both the curb and road sides of the tail-gate, operate the lift. A power package consisting of a self-contained electric motor, rotor-type pump and oil reservoir assembly, mounted directly below the tail-gate for protection from damage and for accessibility, powers the H-11E series. Model H-11 is powered by a rear mounted, gear-type pump, shaft-driven by the transmission power take-off.

The lift lowers by gravity, stopping when it meets the ground, loading dock, or an obstruction. Parallelogram linkage keeps the tail-gate platform level throughout the lifting cycle. Spring helpers aid manual opening and closing. Side latches lock the tail-gate in the closed position and an automatic safety latch prevents accidental lowering. The platform size is 78 x 28 in. with a 5-in. ramp.

More information? Circle Item 19 on postcard, page 155.

Electric Motors Are Rerated

Rerated and improved motors, conforming to the dimensional standards recently adopted by NEMA, have been placed in production by Electro Dynamic Div., General Dynamics Corp., Bayonne, N. J.



Designed more compactly than previous types, the new motors offer the same horsepower provided in less space with reduced weights.

Their design is designated as type H and features a low air opening in the end-bell to protect the winding from liquids and abrasive dust.

Currently, standard ratings are available in frame sizes 182, 184, 213, 215, 254U and 256U. The balance of the rerated NEMA line of motors will extend to 40 hp and 3600 rpm. The present line of NEMA frames 203 through 586 are still available for customers preferring larger frames.

More information? Circle Item 20 on postcard, page 155.

High Pressure Valves

A line of valves for high pressure and high temperature service is available from Yarnall-Waring Co., Philadelphia, Pa.

Named Yarway Welbond, the valves are recommended for general boiler room use including drain service on water wall headers, economizers, water columns and gages; drain and vent services on superheaters and steam lines; shutoff service on sampling lines, bypasses, water gages, water columns and instruments.

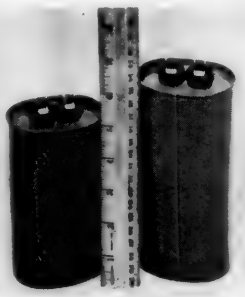
The valves' integral seat of heavy stellite is welded on the seat nozzle and finished before the nozzle is welded to the body. An annular groove absorbs thermal changes near the seat to prevent distortion during welding. It also permits a positive seal when the valve is closed.

To facilitate maintenance, all working parts of the valve can be removed through the yoke. The valves are available in seven sizes from ½ to 2½ in., in angle and straightaway patterns, socket weld ends, and for pressures of 1500 and 2500 psi at 1050 deg F.

More information? Circle Item 21 on postcard, page 155.

Higher Rated Capacitors

A line of drawn oval air conditioner running capacitors, rated up to 20% above present units with the same cross section, is announced by General Electric Co., Hudson Falls, N. Y.



The higher ratings are designed to help manufacturers meet next year's Underwriters Laboratory requirements for room air conditioners. Running current limits, heretofore only recommended by UL, became mandatory on January 1, 1956.

In many cases, manufacturers will have to add capacitance to their units to meet these limitations on current load, G-E engineers pointed out, and many utilities have adopted equipment power factor requirements.

The capacitors are 6¼ in. high, instead of the previous maximum, 5-3/16 in., but have the same base dimensions, 2-5/32 by 2-27/32 in. The oval cases represent a 10 to 20% saving in cost per microfarad.

Improved methods of cold drawing the steel cases and better control of the wider foil and paper rolls have made the new ratings possible. G-E engineers chose to increase the height because space for capacitors in room air conditioners is usually limited in base area but not in height.

The capacitors can be supplied with ratings up to 15 microfarads at 440v, a-c; 20 microfarads at 350v; and 23 microfarads at 330v. Maximum ratings in the present shorter cases are 12½, 17½, and 20 microfarads for the same voltages.

More information? Circle Item 22 on postcard, page 155.

Valve's Rings Are Renewable

A gate valve with renewable seat rings that are replaced with just a screwdriver and with the valve body still installed in the line is announced by The Fairbanks Co., New York, N. Y. Heretofore, when it has been necessary to replace seat rings the valve had to first be removed from the line. With the new valve, it is only necessary to disassemble the two-piece union bonnet, then unscrew and lift out the seat rings from the body. The seat rings slip into place and are secured again with the set screws.

During two years of tests under all conditions from steam to corrosive liquids, the seat rings have been replaced in from 7 to 10 minutes from the time steam was shut off until it was turned on again. In several tests, it was reported that the replacement was done in 4 minutes.

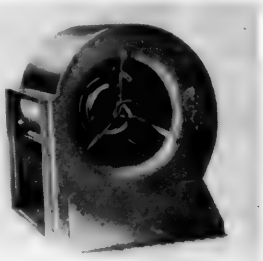
A feature of the valve is that the angle of the pointed end of the retaining screw is complementary to the angle of the seat ring. The resultant line of contact holds the seat rings securely and rigidly in place. The screws are made of silicon bronze which will not gall or freeze. The fine pitch threads of the screw prevent its backing off in service.

Supplied with rising stem (Fig. 1236, illustrated) and non-rising stem (Fig. 1232) in ½, ¾, 1, 1¼, 1½, and 2-in. sizes, the gate valve is suitable for severe service conditions on 200-lb steam and 400-lb water, oil, or gas lines, requiring full flow and frequent operation. The combination of a Monel seat ring and a nickel alloy wedge make the valve corrosion resistant. The valve is of union bonnet construction, with a radial body, bonnet joint reinforced by a heavy octagonal union nut.

More information? Circle Item 23 on postcard, page 155.

Blower Has Motor Inside

A direct drive blower, with its ¼-hp motor mounted completely within the blower wheel, is made by Lau Blower Co., Dayton, Ohio.



Called Electrowheel, the blower is equipped with a specially designed motor that is an integral part of the blower wheel center disc. More efficient absorption of noise and vibration is obtained by the use of the stationary shaft, encased in rubber on both ends. Two rigid tripod mountings give the motor shipping strength, while allowing minimum interference with air flow.

Physically interchangeable with present direct-drive models, the blower gives air deliveries from 500 to 1500 cfm against static pressures from 0.5 to 1.25 inches of water. It is available with or without housing supports, which may be mounted in pre-punched holes for any angle of discharge. There are five sizes and 9- and 10- in. wheels.

More information? Circle Item 24 on postcard, page 155.

Lavatory Is Restyled

Six new models of the Norwich vitreous china lavatory are announced by Crane Co., Chicago, Ill.

Restyling of the lavatory was accomplished by making the rim flat and by pitching it toward the basin for proper drainage. Twin soap depressions and a front overflow are also part of the new design.

The six new models are available in seven colors and white. They include three 24 x 21-in. lavatories: one with a high back for installation with exposed bracket or china leg; another is a slab type for exposed brackets or china leg; and the third is also a slab type for chair carrier with concealed brackets. The three other models are 20 x 18-in. lavatories: one is a slab type for chair carrier with concealed brackets; a second has a high back with an integral soap chamber; and the third is a slab type with an integral soap chamber.

More information? Circle Item 25 on postcard, page 155.

Hot Water Heating Control

A combination regulating and relief valve, designed to increase the efficiency of hot water space heating systems, is offered by A. W. Cash Co., Decatur, Ill.

Known as the Cash Standard Type PR Univalve, the valve is installed in the hot water boiler supply line and automatically controls pressure to insure proper circulation through the system.

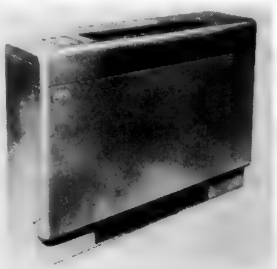
A feature of the valve is a built-in bypass which allows rapid filling of the hot water system, and is a convenient accessory for testing the pressure of the complete system. The high capacity relief portion of the valve is designed to take care of thermal expansion and emergency steam discharge.

The valve has a bronze body and bronze internal parts; a built-in Monel strainer; renewable seat discs on the regulator, relief, and bypass; high-temperature resistant diaphragms and relief disc; and a union end.

More information? Circle Item 26 on postcard, page 155.

Remote Room Conditioners

A line of remote room conditioners, available in three basic capacities of 200, 400 and 600 cfm, is announced by Acme Industries, Inc., Jackson, Mich.



Called Flow-Temp, the conditioners provide conditioned air, with heating and cooling, dehumidification, fresh air ventilation, filtering, and circulation.

Individual control of the units allows the selection of the right temperature of air to suit the occupants of the room. A 4-speed fan control (remotely located if desired) and optional automatic or manual hot and cold water controls maintain the temperature in each room. The units are equipped with low-speed blowers, spun glass insulation, and heavy duty steel cabinets.

The line includes models for ceiling, wall or free-standing floor installations. The floor or wall mounted models are 9¼ in. deep and can be recessed 3¼ in. Cabinets are available for both ceiling and floor models.

Engineering specifications are listed in catalog No. 210-B.

More information? Circle Item 27 on postcard, page 155.

Industrial Axial Fans

A line of axial fans, featuring universal mounting for use in industrial ventilation, process air supply and process air recirculation, is available from American Blower Corp., Detroit, Mich.

Designated Series 203, the fans have cylindrical casings that allow installation in ducts requiring a minimum of space. They can be mounted in a number of ways for either vertical or horizontal air flow. Integral support legs can be provided for wall, ceiling, or floor mounting. When ducts are properly reinforced, the fan can be supported directly by the duct connections. The straight-line air flow eliminates elbows, bends, and transformation pieces.

The fans are available in either tubeaxial (illustrated) or vaneaxial designs.

Tubeaxial fans are available as direct drive units only. With this arrangement, their application is limited to the handling of air or gases which will not damage the motor.

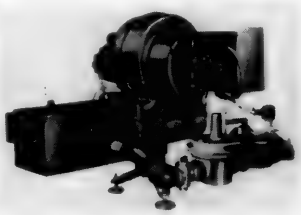
Vaneaxial fans are available as direct drive or V-belt drive units. The V-belt drive type has an externally mounted motor with the belts protected from the air stream by a guard of twin tunnel design. Since the V-belt drive is protected, this arrangement permits use of the fan to handle lightly contaminated air up to 150 deg F.

The tubeaxial fans are available in twelve sizes having free deliveries up to 68,000 cfm and for use with static pressures up to 2¼ inches of water. Direct drive vaneaxial fans are also available in twelve sizes and produce free deliveries up to 58,500 cfm. They are rated for static pressures up to 2¼ inches of water. The twelve sizes of V-belt drive vaneaxial fans provide free deliveries up to 51,000 cfm at static pressures up to 3¼ inches of water.

More information? Circle Item 28 on postcard, page 155.

Gas and Combination Burners

Four commercial gas and gas-oil burners are announced by Iron Fireman Mfg. Co., Cleveland, Ohio. Designed to fire with natural gas only, the gas burners are available in capacities ranging from 500,000 to 3,000,000 Btu per hr input. The combination gas-oil burners fire at rates of from 5 to 20 gph.



Assembled, wired, and tested at the factory, the units are delivered as complete packages. They are supplied with all necessary controls, including an electronic combustion control system. Air for combustion is furnished by an integral fan when either gas or oil is fired. No secondary air dampers are required.

The combination gas-oil burners are adaptable to installations where gas utilities require standby oil heating equipment. Changeover from one fuel to another is made by flipping a fuel selector switch.

Made by the company, the burner motors are sealed against dust and dirt and are permanently lubricated at the factory. They carry the company's standard five-year motor guarantee. All four burners bear the approval of Underwriters' Laboratories, Inc.

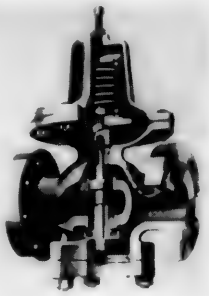
Specification sheets on the new burners are available.

More information? Circle Item 29 on postcard, page 155.

Water Pressure Reducing Valve

A direct-operated, water pressure, reducing valve is introduced by Spence Engineering Co., Inc., Walden, N. Y.

Called the D25, the valve can regulate water flow to such equipment as flushometers and snap cocks. It incorporates a molded diaphragm and heavy spring chamber for operation in the reduced pressure range between 30 and 80 psi.



The valve is designed for dead-end water service where the flow is intermittent and subject to abrupt fluctuations. Its features include a balanced, single seat to minimize variations in delivery pressure resulting from varying inlet pressure; paranite diaphragm; packless construction; and a composition single seat that provides for dead-end shutoff and prevents pressure-creep when no flow is required.

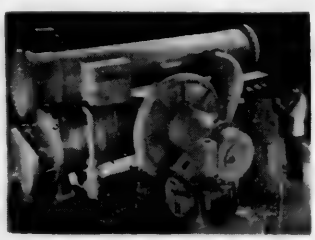
The valve is recommended for industrial processing operations; municipal or plant water mains; apartment houses, hotels, office buildings and hospitals to provide each floor with steady pressure.

More information? Circle Item 30 on postcard, page 155.

Centrifugal Refrigerating Unit

A single-stage, hermetic, centrifugal refrigerating machine, called Tonrac, which has an automatic chilled-water temperature control throughout its full range, is available from American Blower Corp., Detroit, Mich.

The machines are presently available for a tonnage range of 240 to 410 tons. Motor ratings are 250 and 300 hp, both suitable for 115% of rated continuous duty. Hermetic motors are available for 208, 220, 240, 440, 460, 480, and 550 volts; 3-phase, 60 cycles, 3-wire, and 2-phase, 60 cycles, 4-wire current. Reduced voltage starting equipment is required.



The single-stage design contributes to operating efficiency through the elimination of two or more compression stages combined with improved diffusion in the volute casing. This construction avoids extra impellers, housings, and connections and saves space and weight as well as installation and operating costs.

The single impeller in the units is mounted directly on the motor shaft, eliminating the need for field alignment of rotating parts. Motors are standard water-cooled, hermetic, constant-speed (3600 rpm) units. External transmissions or speed increasers are not required.

Hermetic construction of the refrigerating machine provides an enclosure for the motor-compressor assembly. Freon-113 is used in the machine; the Freon-113 is stable in that it will withstand repeated evaporations, compressions, and condensations without disassociation.

The supporting feet of the evaporator and the bottom of the compressor baseplate are at the same elevation, eliminating the need for stepped foundations. The unit can be installed anywhere in a building, from basement to roof; the only requirement is that the supporting structure be capable of carrying the unit's dead weight. Only three major components (evaporator, compressor, and condenser) require field assembly. The unit can normally be installed by 4 men in a single week.

Variable inlet guide vanes, located directly in front of the single impeller inlet, are automatically positioned to regulate the quantity, velocity, and direction of the refrigerant gas flow to the compressor in direct response to cooling load requirements. Guide vanes remain closed when starting until full speed is reached, providing no-load starting. The guide vanes are also closed and produce a virtual no-load condition for the drive motor when the cooling load is zero. A direct-acting thermostat in the chilled-water, exit pipeline controls the position of the guide vanes.

More information? Circle Item 31 on postcard, page 155.

Semi-Steel Float Traps

Float operated traps are now available in a wider range of capacities and sizes from Clark Mfg. Co., Cleveland, Ohio.

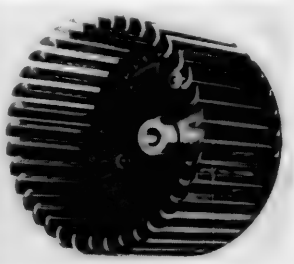
The semi-steel float traps are equipped with duo-step leverage for maximum power and valve travel, providing larger orifices for increased capacities and ability to handle unusual dirt conditions. The float type traps are made for maintaining constant levels, continuous drainage installations, or for dual gravity service.

The traps are made in two series: semi-steel for steam pressures to 250 psi and cold pressures to 300 psi, and fabricated steel for steam pressures to 600 psi and cold pressures to 1000 psi.

More information? Circle Item 32 on postcard, page 155.

One-Piece Blower Wheel

A one-piece, molded plastic blower wheel, called Desco, is being manufactured by Denbo Engineering Sales Co., Inc., Indianapolis, Ind.



The molded plastic blower wheel is aero-dynamically designed, and being one piece, it is always dimensionally constant. It cannot be distorted during assembly, handling or shipping. It does not require individual balancing and finishing or painting for protection against corrosion.

Blade lengths on both single and double inlet types of blower wheel can be supplied in desired lengths to fit any application.

More information? Circle Item 33 on postcard, page 155.

(*Continued on page* 124)

New Revere Copper Drainage Tube

makes possible a 100% Copper Installation at a Competitive Cost—

Why Settle for Less?

Now you can go "all the way" with copper. And here are 7 sound reasons why it will pay you to do just that.

1—REVERE DWV TUBE IS EASY TO HANDLE. A copper tube and fittings installation weighs only about ¼ as much as ferrous materials. In 3" diameter, for example, a 20' length of Revere Copper Drainage Tube weighs only 33.8 lbs.

2—IT COMES IN LONG LENGTHS FOR LONG RUNS. New Revere Copper Drainage Tube is available in standard 20' lengths. When long runs are required, fewer joints are needed. Saves time, saves effort, saves money. No special tools needed.

3—IT IS EASY TO JOIN. Revere Copper Drainage Tube and fittings can be installed by a simple soldering operation making joints certain. Job is practically finished before you can get started on a caulked or threaded joint. And with Revere Copper Drainage Tube joints almost never have to be redone.

4—CAN BE PREFABRICATED IN SECTIONS IN YOUR SHOP. Subassembly in the shop (or on the job) of easy-to-join Revere Copper Drainage Tube cuts time and costs to a minimum. Joints are rigid and permanent.

5—IT REQUIRES LESS CARPENTRY AND SPACE. With compact Revere Copper Drainage Tube and fittings there is no need to plan for wide plumbing walls or build-outs. Where 3" vent stacks are permitted, they will fit inside a standard 4" stud partition.

6—THERE IS NO CLOGGING. Drainage systems of Revere DWV Tube and copper drainage fittings are gun-barrel smooth inside, as well as outside. Frictional resistance to flow is low. Clogging of copper lines is virtually unknown.

7—IT IS NEAT IN APPEARANCE. New Revere Copper Drainage Tube adds to the salability of new homes . . . the re-sale value of old ones. All-copper plumbing is the "badge" of a quality home.

AND OF COURSE Revere Copper Drainage Tube cannot rust...will last as long as the building in which it is installed.

SEE YOUR REVERE DISTRIBUTOR FOR SIZES AND COMPLETE DETAILS OR SEND FOR FREE DATA FOLDER

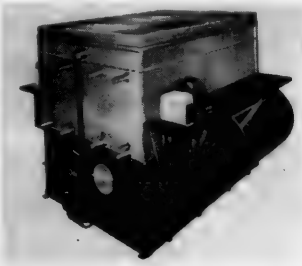
REVERE COPPER AND BRASS INCORPORATED, 230 PARK AVE., NEW YORK 17, N.Y.

Mills: Baltimore, Md.; Brooklyn, N. Y.; Chicago, Clinton and Joliet, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Newport, Ark.; Rome, N. Y.
Sales Offices in Principal Cities, Distributors Everywhere

(*Continued from page* 122)

Condensers and Towers

A line of evaporative condensers (Model MC, illustrated) and a line of cooling towers (Model MT) are introduced by Baltimore Aircoil Co., Inc., Baltimore, Md. The two lines include evaporative condensers up to 350 tons nominal capacity and cooling towers up to 400 tons nominal capacity, each in a single, factory-assembled unit. The units are compact and require a minimum of installation space.



Employing galvanized, centrifugal fans, the equipment is designed around the blow-through principle. The units are made so that increased capacity requirements, due to future plant expansion, can be achieved by the installation of additional sections to the basic unit, as and when required.

One feature of the new models is that the objectional water drip noise commonly present in evaporative condensers and cooling towers has been almost completely eliminated. This, coupled with the use of centrifugal fans and low discharge air velocities, make the units relatively quiet.

Both the condensers and the towers are protected against corrosion by the company's mastic and its zinc-chromatized, aluminum paint, which are in addition to galvanizing. All moving parts are located so that they are accessible for maintenance.

More information? Circle Item 34 on postcard, page 155.

Submersible Booster Pump

A submersible booster pump, the Verti-Line, has been designed to meet the requirements of industrial and municipal pump users by Layne & Bowler Pump Co., Los Angeles, Calif.

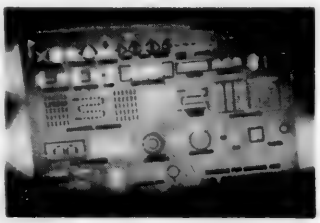
In order to meet the varied demands of industrial application, the submersible booster pump embodies refinements such as: an oversize shaft, longer bearings with protective caps, a mechanical shaft seal designed for submerged service, and a choice of either mixed or radial-flow impellers. The GE submersible motor has a large oil reservoir and a spring-loaded resilient bag which permits the sealed motor to breathe with changing pressures and temperatures.

Most of the pumps are factory assembled units, adjusted and tested so that the equipment is ready for use upon installation without venting, filling, adjusting, or aligning. Standard models are available from 5 to 150 hp, with discharge heads from 50 to 500 ft and 100 to 4000 gpm capacity. They are suited to typical sump, line booster, cooling tower, fire protection and barrel pumping installations.

More information? Circle Item 35 on postcard, page 155.

Template Aids Drawing

A rigid, vinyl plastic template which contains the cut-out symbols of approved ASA-Z Standard heating and air conditioning diagrams is available from A. Lawrence Karp, Greenwich, Conn.



For detailing and drafting work, a pencil or pen is run through the engraved template to draw symbols of convectors, condensers, heat exchangers, cooling towers, evaporators, valves, vents, vibration absorbers, receivers, traps, floats, filters, and compressors. The template measures 5 x 7 in.

A manual and catalog of other templates of interest to the trade is available from the manufacturer.

More information? Circle Item 36 on postcard, page 155.

Sling Psychrometer

A sling psychrometer has been improved by Taylor Instrument Companies, Rochester, N. Y., to make it easier to use than previous models.

A feature of the psychrometer is the gold back of the thermometer tubes which gives a greater contrast to facilitate reading. To further increase the contrast, the protective back is finished in gray, gun-metal enamel.

Attached to the metal back, the handle of the psychrometer is so constructed that it folds out of the way when not in use.

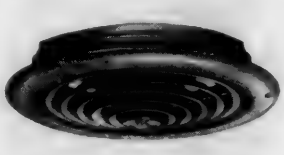
Measuring 9 in. long, the instrument is packed with a booklet containing illustrative humidity tables. It comes with a supply of wicks and is furnished in a plastic case.

A slide rule which translates wet and dry bulb readings into relative humidity values is supplied at extra cost.

More information? Circle Item 37 on postcard, page 155.

Diffuser Can Be Adjusted

An adjustable ceiling diffuser is announced by Air Control Products, Inc., Coopersville, Mich. It has been designated No. 72.

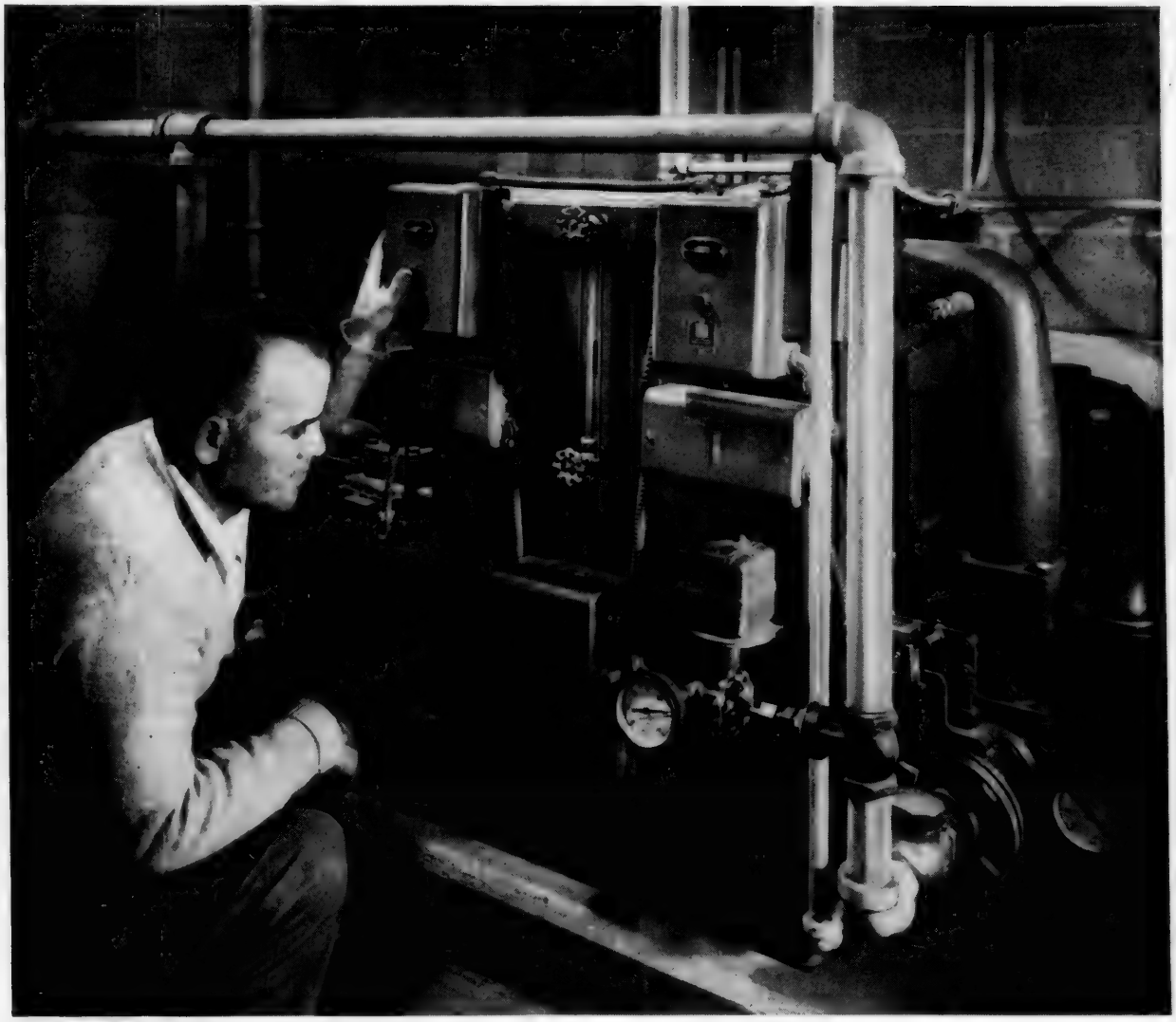


The diffuser is designed for applications where a varying air pattern is demanded, such as in combined heating and cooling installations. The performance of the diffuser ranges from a flat horizontal air movement, at the ceiling, to a concentrated vertical pattern. Adjustment is made by turning the center cap. This operation moves the center ring assembly up or down to the pattern desired.

Six listed sizes of the diffuser are available. They range from 8 to 22 in. The No. 74 damper, a special unit, has been designed for use with the No. 72 diffuser.

More information? Circle Item 38 on postcard, page 155.

(*Continued on page* 126)



This pump puts maintenance men on the shelf

The maintenance man who depends on repairing Dunham Vacuum Heating Pumps for his living . . . can quit right now. There's nothing for him to do.

Dunham Code Rated Pumps just don't *require* extensive maintenance—even after 15-20 years of continuous service producing high vacuum (26 in., if required) at low amperage. Here's why:

Dunham Pumps need no close clearance adjustment to maintain capacity . . . no extra-high air capacities to compensate for lower efficiency due to pump wear.

Dunham Pumps have *only one* principal moving part.

Dunham Pumps need *only one* motor for removal of *both* air and condensate.

Dunham Pumps have no vacuum on pump stuffing box.

Dunham Pumps are code rated—your assurance of more than adequate air capacity, without overrating to compensate for leaky systems.

Dunham Pumps have heavy-gauge copper bearing steel tanks for maximum resistance to corrosion.

Single and duplex models in capacities from 2500 through 65,000 EDR. For full information, mail coupon.

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HEATING & COOLING EQUIPMENT

RADIATION • CONTROLS • UNIT HEATERS • PUMPS • SPECIALTIES

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Please send me Vacuum Pump literature.

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(*Continued from page* 124)

Exhaust Gas Analyzer

A portable instrument for the measurement of oxygen and combustibles in exhaust gases has been developed by Instrument Div., Davis Emergency Equipment Co., Inc., Newark, N. J.

The instrument is designed to meet the testing requirements of the many diverse industries using different kinds of combustion processes. It is built into an aluminum carrying case, 18 x 12 x 18 in., and weighs 35 lb.

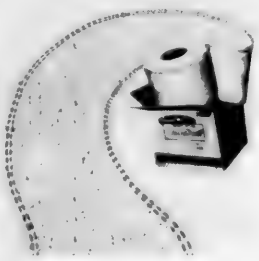
Oxygen is measured by catalytic combustion, employing a disposable container of propane. The results are registered on a scale with two ranges—0 to 5% and 0 to 21%. Combustibles are measured in a separate cell and are indicated on an individual meter, also with two ranges—0 to 3% and 1 to 15%. Both can be read simultaneously.

The company offers to arrange plant demonstrations through its local representatives.

More information? Circle Item 39 on postcard, page 155.

Longer Duct Connector Rolls

Flexible duct connectors, called Vibra-Stop and Flexi-Duct, are now available in rolls of 25, 50, and 100 ft from Grant Wilson, Inc., Chicago, Ill. The Vibra-Stop connector is now fabricated with either 24- or 26-gage No. 1 prime galvanized metal.



The new lengths and gages are added to the line to meet trade demands. Both types of duct connector are for use on heating, ventilating, and air conditioning installations to stop system noises and allow a greater tolerance in both the length of duct and duct alignment.

The Flexi-Duct is woven asbestos flexible tape available in 6- and 8-in. widths. The Vibra-Stop connectors come in asbestos and canvas. A 4-in. strip of either material is sealed to a 4-in. width of No. 1 prime galvanized metal on one side and a 3-in. width on the other side.

The rolls are individually packaged in cartons.

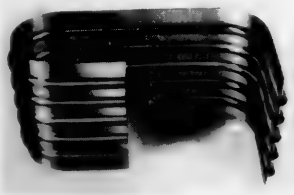
More information? Circle Item 40 on postcard, page 155.

One-Piece Plate Coils

A mill product in the form of a single strip or sheet of solid copper, brass, or aluminum in which tubes are inflated to desired running lengths is announced by Revere Copper and Brass, Inc., New York, N. Y.

Designated as Tube-In-Strip, the product is said to have applications in refrigeration and air conditioning, chemical, food and petroleum processing, automobile radiators, water heaters and coolers, gas heaters, and radiant panel heating.

Made of one piece of metal only, the coils and sheets are not discernibly different from the standard strip and roll products normally produced in the rolling mill. However, the material has incorporated within it expandable portions which can be inflated by the user into continuous running lengths of tube of whatever size and spacing or combinations of sizes and spacings specified when ordering it. Except for the expandable portions, the sheet is a solid strip of metal derived from a suitably treated casting and does not consist of two pieces of metal brazed, welded and rolled together.



The metal can be stamped or drawn into desired shapes prior to the expansion of the channels. The expanded channels can be made circular in section, or, during the expansion operation, the metal can be forced into dies for producing other than circular sections.

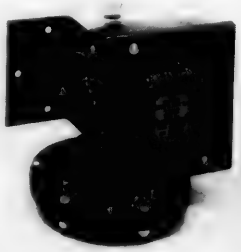
The material can be furnished in long coils or in cut flat sheets in widths up to 16 in. at present and wider later. Tube spacing can be generally as close as ¼ in. and closer in some instances, and as widely apart as the width of the metal permits. Inside diameters of the tubes can vary from approximately 3/16 to ⅝ in. inclusive, when unexpanded. Tube wall gage can vary from 0.0025 in. to whatever the inflation equipment permits.

More information? Circle Item 41 on postcard, page 155.

Vacuum Control

A vacuum static pressure control is added to the line of low pressure switches made by The Henry G. Dietz Co., Long Island City, N. Y.

Designated Cat. 110V, the control is designed for use on very low vacuums where regulation is required in inches of water column. It finds application as an air vacuum interlock switch for use in equipment requiring safeguards to assure a specific vacuum to prevent a hazardous condition. It is also applicable for use in combustion equipment, air conditioning, and industrial applications.



The control has a dust tight enclosure with a rubber seal. The sensitivity of the control is made possible by the use of diaphragms made of material suitable for each specific application. Its range is adjusted by means of a knurled knob located outside the housing.

Standard units are available for 0-to-1 inch of water column vacum and 0-to-4 inches of water column vacuum. Minimum *on-off* differentials of 0.1 inch of water column are also available. The electrical ratings of the SPDT switch are 15 amp at 120-250v a-c, ⅛ hp, or 125 volt-amperes pilot duty.

More information? Circle Item 42 on postcard, page 155.

(*Continued on page* 128)

NEW... *Quiet, efficient, power-packed*

10 H.P. Copelametic

FOR... PACKAGED AIR CONDITIONING

There was plenty of interest in this 10 H.P. Copelametic when we introduced it at the ARI Show in Atlantic City. Many features make it ideal for quality, packaged air conditioning.

The 10 H.P. Copelametic motor-compressor fits neatly into a compactly designed unit. For greater capacity, two motor-compressors can be installed for flexibility in operation.

Use of suction cooling and Freon-22 give the 10 H.P. Copelametic high capacities with low power input. As in all time-proved Copelametics, belts, seals and manual oiling are eliminated. Being accessible, adjustments and parts replacement can be made on the spot with minimum loss of operating time.

Everything required in package air conditioning is featured in the 10 H.P. Copelametic. It is compact . . . rugged . . . efficient . . . quiet-running . . . accessible. It has the protection of positive lubrication.

A comprehensive, detailed engineering packet describing the 10 H.P. is available. SEND FOR YOURS.

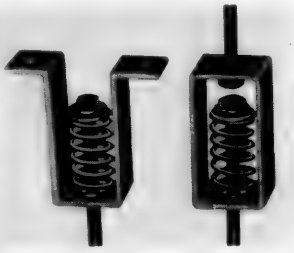
SINCE 1918

Copeland REFRIGERATION CORPORATION, Sidney, Ohio

(*Continued from page* 126)

Hangers Absorb Pipe Expansion

Vibration hangars have been designed to prevent transmission of noise and vibration from suspended equipment and piping systems by T. R. Finn & Co., Inc., Hawthorne, N. J.



Known as Finnflex Types S (left) and SC (right), the steel spring vibration hangers consist of a helical steel spring enclosed in a steel housing. The springs are manufactured of oil-tempered carbon-steel wire with cadmium plating to prevent corrosion. They will withstand high temperatures without creep or permanent set and low temperatures without increase in stiffness.

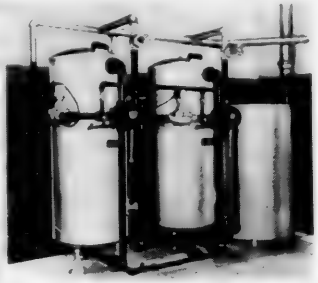
In both types the suspended load is transferred to the isolating spring by means of rods or bolts with washers that rest on the bearing plates which enclose the isolating medium. The top bearing plate is capped with a rubber isolation washer to minimize noise transmission. At the bottom of the steel housing is a rubber damper washer to limit excursion at resonance.

The hangers are intended for use where large deflections are required due to thermal expansion of pipe lines, where high and low temperatures are involved, and where very low disturbing frequencies are encountered. Their rated load capacities range from 50 to 1000 lb.

More information? Circle Item 43 on postcard, page 155.

Twin Water Softeners

A line of water softeners for manufacturing plants, institutions, and commercial establishments has been developed by Hagan Corp., Pittsburgh, Pa. in conjunction with Calgon, Inc., a subsidiary.



The softeners are sold as package units, so that only the connections are needed to fit a unit into a water system. A supply of a resinous exchange material is provided with each unit.

Each unit consists of a brine tank and a softener tank, with controls and piping in place. Twin units (illustrated), which include two softener tanks with a single brine tank (right), also are available. With twin units, one tank is always on the line to supply soft water while the other is being regenerated.

Flow rates as high as 175 gpm for a single unit, or 350 for a twin are available with capacities between regenerations ranging up to 1,500,000 grains for a single unit and 3,000,000 grains for a twin.

In the softener tank, the exchange material rests over a bed of gravel. As raw water passes through the tank, the calcium and magnesium salts combine with the exchange material, so that the water leaving the tank is softened. When the resin becomes saturated, it can be regenerated by an ordinary salt solution drawn from the brine tank.

Each softener tank is equipped with an automatic backwash control that maintains the correct flow of water through the unit during backwash, preventing a loss of resin but insuring sufficient flow for adequate cleansing of the exchange material.

More information? Circle Item 44 on postcard, page 155.

Bronze Valves for LP Gas

Two bronze valves designed for liquefied petroleum gas service are announced by Ohio Brass Co., Mansfield, Ohio. Both are listed by Underwriters' Laboratories.

A lever-operated valve, No. 8009, has a special safety feature to reduce chances of burns when LP gas is being transferred from tank to tank. Designed for use as a nozzle, the valve permits back pressure to escape from the line in the direction away from the operator. It is recommended for use on pressures up to 400 lb gas, oil, or water and is available in three sizes, ½, ¾, and 1 in., complete with a malleable iron handle and a 6-in. pipe nipple.

The No. 8001, also for pressures up to 400 lb gas, oil, or water, has the conventional globe valve design. It features an outside bonnet and a slip-on disc holder to facilitate changing discs. It has a free swivel action between the disc holder and stem. The valve comes in nine sizes from ⅜ to 3 in.

Discs and packing in both valves are made of Buna-N, recommended for service on volatile materials like LP gas.

More information? Circle Item 45 on postcard, page 155.

Portable Pump-Motor Unit

A close-coupled, portable electric motor and pump unit with a dry suction lift of approximately fifteen feet is available from Jabsco Pump Co., Burbank, Cal.

Designated as Model 4720, the unit consists of a stainless steel (Type 316) self-priming pump mounted directly on the shaft of a ¼-hp, 1725-rpm electric motor. It has a Neoprene impeller with ½-in. inlet and outlet ports designed to accommodate standard piping.

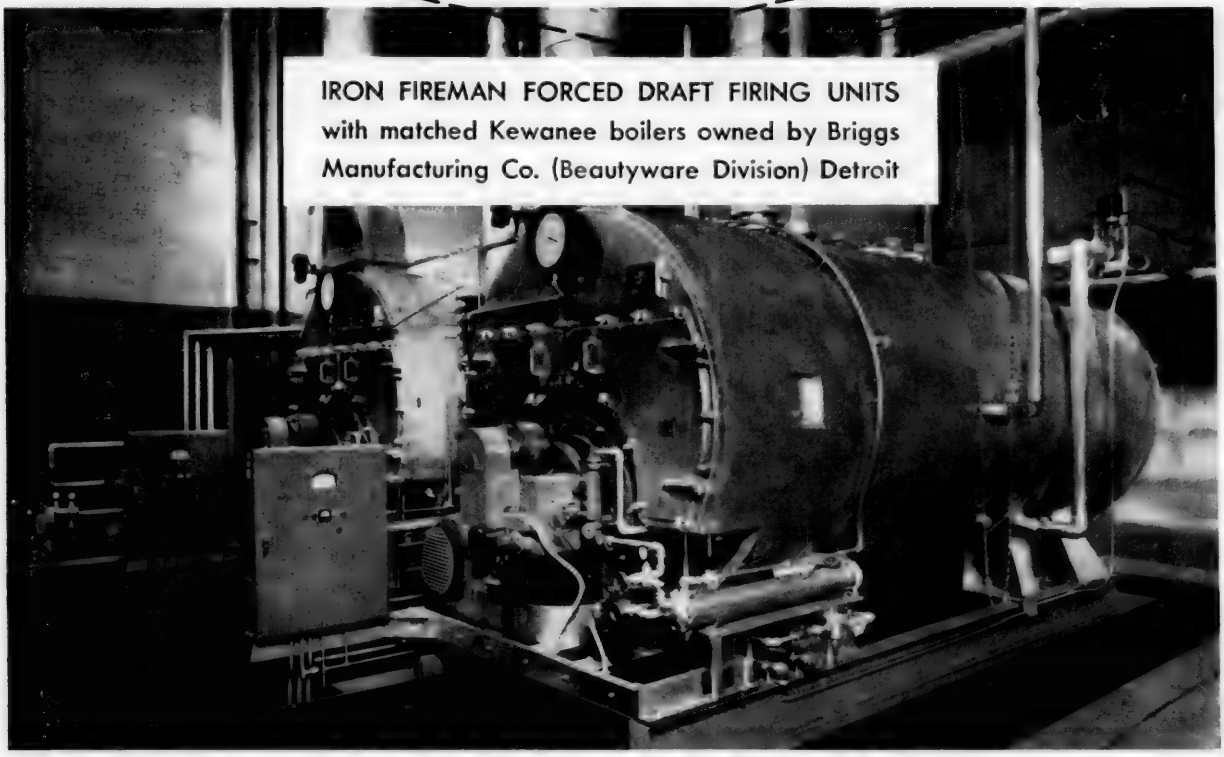
The pump-motor combination is used for general transfer applications in chemical, pharmaceutical, food, and general industries.

Operating on 115v, 60 cycle, single phase a-c, the pump has a capacity of 10 gpm against a 10-ft head and is suitable for use up to 20 psi pressure. The overall assembly measures 6½ x 11½ x 10 in. high and weighs approximately twenty-five pounds. It is furnished with a 6-ft motor cord.

More information? Circle Item 46 on postcard, page 155.

(*Continued on page* 130)

What a truly modern heating plant looks like


IRON FIREMAN FORCED DRAFT FIRING UNITS
with matched Kewanee boilers owned by Briggs
Manufacturing Co. (Beautyware Division) Detroit

Jahr-Anderson Associates, Architect-Engineer, Dearborn, Mich. W. J. Rewoldt Co., Mechanical Contractors, Detroit. Iron Fireman equipment installed by Comb & Groves, Detroit.

COMPLETE FIRING SYSTEM IN ONE PACKAGE

Every essential component is built into this Iron Fireman forced draft firing system, including burner, control panel, forced draft air supply and fuel system. Complete unit is factory assembled, wired, and tested.

FIRES ALL TYPES OF BOILERS

Firing unit can be applied to any type of boiler with great advantages in installation costs and operating efficiency. Complete boiler-burner unit is also available as pictured above, with matched Scotch type boiler. Installation requires little more than service connections. No high stack needed.

ONE CONTRACT—ONE RESPONSIBILITY

Installation costs are greatly reduced. No separate contracts for control system, electrical wiring, oil heaters, or burner setting.

FOR GAS OR OIL, OR OIL-GAS COMBINATION

Takes any type of high or low pressure gas, or any grade of oil from No. 2 to No. 6. Oil-gas model can be switched from one fuel to another at a moment's notice without loss of firing efficiency.

The smart way to modernize

Unlike typical conversion burners, the Iron Fireman forced draft firing system is completely assembled at the factory, and mounted on a permanent base for fast and accurate application to your present boiler. It is a completely engineered unit, leaving no intricate wiring or piping for completion on the job.

Where a complete boiler-burner unit is required, the Iron Fireman forced draft firing system is supplied as an integral part of a matched Titusville or Kewanee boiler, as in the Briggs plant pictured above. The rated capacity of these boiler-burner units (for either high or low pressure steam) allows an ample margin which can easily carry overloads of 50% or more. This permits a comfortable "cruising speed" that assures long life and low maintenance costs.

Ask for full information

Send coupon for complete technical description and specifications.

IRON FIREMAN®

Automatic firing equipment for heating, processing or power with oil, gas or coal.

COMMERCIAL • INDUSTRIAL • RESIDENTIAL

IRON FIREMAN MANUFACTURING COMPANY
3035 West 106th Street, Cleveland 11, Ohio.
In Canada: Write 80 Ward Street, Toronto, Ontario.

Name_____

Firm_____

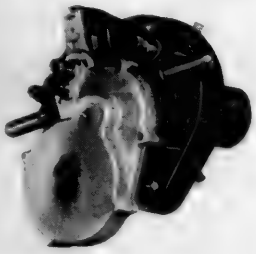
Address_____

City_____ Zone____ State_____

(*Continued from page* 128)

Threader Drive Is Portable

A portable power unit, called Porta Drive, for pipe threaders has been improved by Muncie Gear Works, Inc., Muncie, Ind. A ½-in. electric or air drill can supply power to the drive.



With a 20-to-1 gear ratio, the drive unit is designed to power all standard geared pipe threaders. The unit is reversible. It threads 1- to 2-in. pipe, using adapters, and will thread 2½- to 6-in. pipe with or without a vise. It can be used on the average shop work-bench and in absence of power can be operated with the aid of an ordinary carpenter's brace.

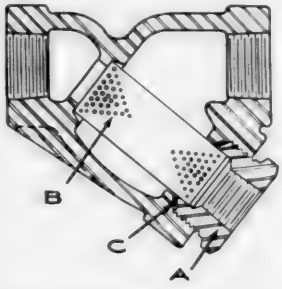
Weighing 14 lb, the unit can replace larger, more complicated threading machinery in a shop. Moreover, a mechanic can carry it in an ordinary tool kit, and it sets up simply and quickly for use indoors or out.

The drive also is being used to pull cable (with a Greenlee cable puller) and to operate pulleys, hoists, and conveyors or to roll tubes in boilers.

More information? Circle Item 47 on postcard, page 155.

Y-Type Pipe Strainers

Six sizes of carbon moly-steel strainers have been developed by Armstrong Machine Works, Three Rivers, Mich., as additions to its present line of cast, semi-steel strainers.



The Y-type pipe strainers, for oil, gas, air, water, and steam lines, are suitable for pressures to 900 lb and temperatures to 900 deg F. Maximum pressure at 100 deg is 1800 psig.

The strainers are available in ½- through 2-in. sizes, either screwed or socket weld. Sizes 1¼, 1½, and 2 in. have bolted retainer plates. Smaller sizes have straight thread, screwed bushings (A).

Stainless steel screens (B) are standard, either 0.045-in. diameter holes (226 per sq in.) or 24 x 110 wire mesh.

Design features include a stainless-asbestos gasket (C) which is locked in between the body and the base of the bushing to eliminate the chance of blowouts.

More information? Circle Item 48 on postcard, page 155.

Line of Automatic Welders

Equipment for hidden or submerged arc welding is produced by The Lincoln Electric Co., Cleveland, Ohio. The line includes three welding heads, controls and adjustments, accessories, and two power sources.

The welding heads, LAF-3, LAF-4, and LAF-5, offer users a choice of heads for either a-c or d-c current, field or shop welding, and constant potential or variable voltage power source. The operation controls permit a choice of instantaneous starting, either hot for intermittent welding or cold for precision starting; a choice of variable inching speeds, either slow or fast, away from or to the work; and a choice of carriage operation to give stand-still starts, flying starts or manual control.

Electrodes in sizes from 3/32 to 7/32 in. are handled by one set of drive rolls, accessible through a hinged door. A separate set of changeable rolls handles 5/64-in. diameter wire. A roller bearing wire straightener with a single adjusting screw can be swung 360-deg about a vertical axis to accommodate wire reels in any position.

In addition to heads, mounting equipment is available to give either a stationary mounting, mounting on a self-propelled travel carriage, or on a self-propelled tractor. The heads can be adapted for Twinarc or tandem arc welding or for an oscillating attachment, the Spreadarc.

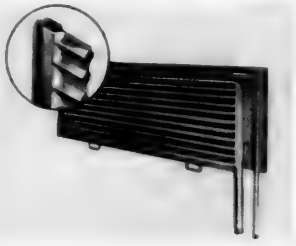
A power source is the AC-750, which gives 750 amp continuous duty a-c power. It has a power-driven reactor control for setting current from remote switches on the welding head control box. Taps for Scott connections are available for setting up power supply for tandem welding. These furnish a 90-deg phase relationship for welding current from 3-phase current supply.

More information? Circle Item 49 on postcard, page 155.

Coil's Ratings Are Increased

A 50% increase in pressure rating for two styles of Platecoil heat transfer units is announced by Tranter Mfg., Inc., Lansing, Mich. The coils consist of embossed sheets of metal welded together (or to a flat companion plate) to form channels for the passage of heating or cooling media.

Pressure ratings have been increased for two styles of header-type, double-embossed units. The units are now offered for use up to 150 lb maximum operating pressure; the previous maximum recommended by the manufacturer was 100 lb.



The increased rating retains the 1 to 4 factor of safety between maximum operating pressure and rupturing pressure. Laboratory hydrostatic tests of the coils show the rupturing pressure for the double-embossed, header type to be 600 lb or more. This safety factor is specified in the ASME code for unfired pressure vessels and also in the API code. Neither of these codes applies specifically to the coils, but the manufacturer has used these codes as a guide in rating its product.

The pressure limitations apply to the coils made of cold rolled steel and the various alloys in which they are available. For single-embossed, header-type units, a maximum operating pressure of 70 lb is recommended. For serpentine type coils, the maximum operating pressures recommended are 200 lb for double-embossed, and 125 lb for single-embossed.

More information? Circle Item 50 on postcard, page 155.

(*Continued on page* 132)

When price is NOT the Answer!...

Schools need dependable sump pumps that provide years of trouble-free service

In selecting a sump pump for school installations first consideration must be given to long life, low maintenance costs and enduring dependability.

The Electric Water Boy is designed and manufactured to meet all of these requirements.

Heavy duty motor with a high starting torque prevents stalling. An overload relay protects the motor. Permanently lubricated extra heavy ball bearings insures a long life.

The Electric Water Boy pumps are conservatively rated and precision made of the finest materials.

Construction

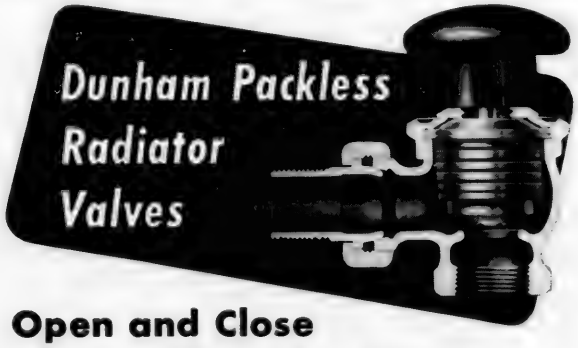
Bronze impeller, adjustable steel coupling, capacitor motor, rigid hanger pipe and rugged construction thruout insure long life. Send for Bulletin F 501 C.

Specify and Install the Electric Water Boy

Available for immediate delivery from Factory Stock

weil PUMP COMPANY

1516 No. Fremont St., Chicago



Open and Close in Less Than One Turn

You can fully open and close dial-equipped Dunham Packless Valves—in *less than one complete turn.* And the handle always turns easily, too.

That's because these valves are *truly packless* without springs, packing, or stuffing boxes. Steam, water or dirt can't come in contact with the valve spindle. As a result, the valve handle always turns freely.

Dunham No. 1140 Packless Valves come in 4 body patterns, 5 sizes from ½-in. to 1½-in.

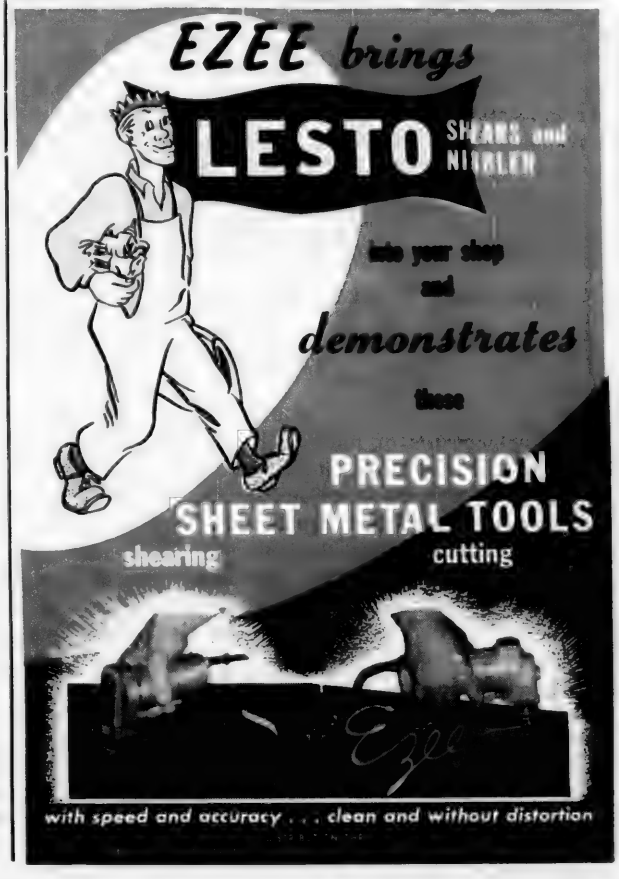
For complete information about Dunham Specialties, WRITE FOR BULLETIN ACHV-2A.

DUNHAM®

HEATING & COOLING EQUIPMENT

RADIATION • CONTROLS • PUMPS
UNIT HEATERS • SPECIALTIES

C. A. DUNHAM COMPANY, 400 W. MADISON ST., CHICAGO 6, ILLINOIS



(*Continued from page* 130)

Vane Measures Wind Velocities

A vane for the measurement of wind velocities and peak gusts in the range from 3 to 200 mph is announced by Hastings Instrument Co., Inc., Hampton, Va.

Named the Jet-Vane, the instrument contains no rotating cups or propellers to introduce friction and lag errors in velocity readings or to fail under high velocity wind conditions. It is suited for the measurement of sudden peak gusts, rapidly fluctuating air currents, and sustained winds of high velocity.

Designed along aerodynamic lines and constructed of cast aluminum, the instrument employs the same patented, noble-metal, thermopile principle used in the company's low velocity air meters but in an outdoor unit designed primarily for weather stations, airports, radio and television stations.

The sensing element of the instrument is composed of short, butt-welded, noble-metal thermocouples which are self-compensating for temperature changes and is located in the vertical shaft. Air entering through the opening in the nose of the vane is channeled to the elements in such a manner that rain or foreign matter passes through a bleed hole and leaves the vane without striking or coming in contact with the thermopile sensing element.

The instrument weighs 1 lb 11 oz, measures 12 in. from noise to tail, and is 15 in. high, including the ball bearing mounting shaft. It is suitable for installation at remote locations such as antenna towers or roof tops and is available with either wall or desk type indicating units. It can also be supplied with a recording unit, if desired.

More information? Circle Item 51 on postcard, page 155.

Commercial Water Softeners

A line of industrial and commercial water softeners and conditioners is introduced by Culligan, Inc., Northbrook, Ill.

The industrial softeners feature a water collection system that consists of finely slotted manifolds spaced 6 in. apart at the bottom of the tank. This makes the water pass through the entire mineral bed. It eliminates the chance one downward channel will be created, thus causing the water to bypass the bulk of the mineral.

Another feature of the new models is a meter that indicates the amount of softened water used. Users can tell how many gallons of water will be available before the next regeneration cycle must be performed.

A built-in alarm, offered as optional equipment, signals the time for regeneration.

Buyers have a choice of two minerals, Cullex or Cullite. A free water analysis by the company's local dealer will determine which is best suited for the water supply.

Twelve model sizes offer capacity ranges from 255,000 grains to 2,304,000 grains. All are competitively priced.

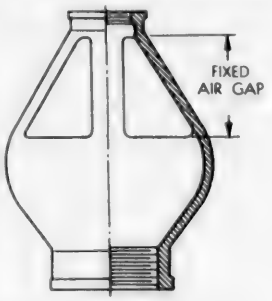
Iron removal units, chlorinators, chemical feeders, and water filters are also commercially available. Where only a moderate quantity of conditioned water is needed, water softeners, demineralizers, and filters are available on the company's service basis.

More information? Circle Item 52 on postcard, page 155.

Air Gap for Drain Lines

A fixed air gap, designed to eliminate cross connections between water supply drain lines and sewers, has been developed by Norman Boosey Mfg. Co., Detroit, Mich.

Available in two styles, the 2021 and the 2030 (illustrated), the air gaps guard water supply drains from sewage contamination.



The 2021 is available in lengths of 8, 11½, 15½, and 19½ in. It is designed with a tapped inlet and a tapped or spigot outlet; the outlet is larger than the inlet to accommodate requirements of the average installation.

The 2030 is designed in one standard length of 5½ in. With standard fittings, the inlet size of ¾ in. and the outlet of 1½ in. can be adjusted to fit smaller inlet and larger outlet lines.

The height of the fixed air gap for both styles complies with accepted standards for the inlet diameter.

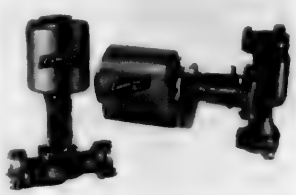
Principal uses for the fixed air gaps are on drains from elevated water reservoirs, processing equipment, storage tanks, air conditioning units, cooling coils, refrigeration units, hospital equipment, and kitchens.

More information? Circle Item 53 on postcard, page 155.

Dual Position Circulator

A dual position hot water circulator is announced by Econo Products Co., East Haddam, Conn.

Design changes to the company's Magic Head circulator incorporate a motor with a built-in thrust bearing that permits the circulating pump to be used as either a horizontal or vertical circulator.



To install the pump as a vertical circulator, the installer needs only to attach vertical oil cups, which are supplied by the manufacturer. The combination circulator eliminates the need for stocking both a horizontal and vertical circulator.

To further simplify the stocking of various sized circulators, the combination of pump, impeller, and oversized waterways in the pump head, permits the use of either ¾, 1, 1¼, or 1½-in. pipe flanges.

More information? Circle Item 54 on postcard, page 155.

(*Continued on page* 134)

Mr. Stevenson shows Glasfloss Filter used at Loft's newest store, The Candy Garden, Route 22 outside Union, N.J. The building, 65' x 25', contains both a candy kitchen and a sales area. Pittsburgh Plate Glass Solex, used in the windows, cuts down heat from the sun's rays.

The Candy Garden is serviced by a 15-ton conditioning unit, circulating 6,000 cfm. Filters are changed every two weeks, year-around, since unit is used for both heating and cooling.

"Glasfloss Air Filters cost us less to use . . . provide more efficient service"

reports Thomas Stevenson
Loft Candy Corporation's Director of Maintenance

Air conditioning and cleanliness are paramount in the business of selling candy to the public. A constant temperature of 70 degrees year-around is needed to preserve the shape, taste and appearance of freshly made chocolates; candy shop interiors must always be spotless to attract and keep customers.

In Loft Candy Corporation's 200 stores, air conditioning maintenance and air filtering have been materially improved by using Glasfloss Air Filters. Short, brittle glass fibers no longer clog air conditioner condensate lines and drains. Elaborate maintenance procedures made permanent metal filters impractical for the firm's use.

"The Glasfloss Filters can be, and often are, changed by our sales girls," Mr. Stevenson explained. "They are also lightweight, easy to insert in the conditioning units, and long-lived because they filter in depth . . . that is, the dirt particles don't just encrust the surface. They are absorbed by the body of the filter."

There you have the important reasons why Glasfloss Air Filters are importantly different from conventional fiber glass or glass wool filters. Long, silky Glasfloss fibers are kind to the hands. Glasfloss offers less air resistance, holds more dust and dirt, doesn't surface load. In daily operations, these features mean dollars and cents saved in your office, store, plant or building. For more information, write Glasfloss Dept., Fiber Glass Division, Pittsburgh Plate Glass Co., One Gateway Center, Pittsburgh 22, Pa. Ask for a copy of Bulletin #455.

GLASFLOSS IS A PRODUCT OF THE FIBER GLASS DIVISION OF PITTSBURGH PLATE GLASS COMPANY

Sales Offices are located in the following cities: Charlotte, Chicago, Cincinnati, Cleveland, Detroit, Houston, Los Angeles, New York, Philadelphia and St. Louis

FIBER PG GLASS **PAINTS · GLASS · CHEMICALS · BRUSHES · PLASTICS**

PITTSBURGH PLATE GLASS COMPANY

(*Continued from page* 132)

Three Types of Room Coolers

For 1956, the line of room air conditioners introduced by Airtemp Div., Chrysler Corp., Dayton, Ohio, consists of three major divisions: Imperial room air conditioners (illustrated) which are designed for either in-the-wall or in-the-window installation; conventional, flush-mounted window models; and casement window models.

Available in ½, ¾, and 1-hp capacities, the Imperial model can be built right into the wall or, similarly to a conventional room conditioner, it can be installed in a 28-in. window or larger. Its control switches are situated on the side of the cabinet, and it is equipped with a cooling thermostat.

Designed for flush mounting, the conventional units are made in Deluxe models with ¾, 1, and 1½-hp capacities, and in Special (economy-priced) models with ¾ and 1-hp capacities. The units are equipped with an adjustable plastic grille for directing the conditioned air, high and low speed fan control, fresh air and exhaust control, and a thermostatic control.

For casement windows, units in both Deluxe and Special (economy-priced) models are available in ½ and ¾-hp capacities. Adaptable for windows of non-standard dimensions, the units are attached to the window in the same manner as a screen. The Deluxe models have a two-speed blower for night operation or for bedrooms.

More information? Circle Item 55 on postcard, page 155.

Centrifugal Fans

A backward curve, non-overloading fan that features hollow-sectioned, aerodynamically shaped, airfoil blades is introduced by Chicago Blower Corp., Franklin Park, Ill. The shape of the blades eliminates eddy currents that create turbulence and noise.

The die-formed, hollow section blades are welded to a heavy steel back plate, to which has been welded a solid, turned steel hub. All wheels utilize an aerodynamically designed plate, or shroud, spun from heavy gage steel, which is welded into place and acts as the outside support for the blades.

Available with direct or V-belt drives, the fan meets the requirements for commercial and industrial ventilating, air conditioning, and heating applications, as well as forced and induced draft. A steep pressure characteristic curve and a low noise level permit its use for high pressure air conditioning systems. It can be furnished to withstand abusive service and high pressures.

Wheel sizes are available from 13½ to 143 in. in diameter. Air deliveries range from 600 to 1,000,000 cfm against static pressures from ⅛ to 32 in.

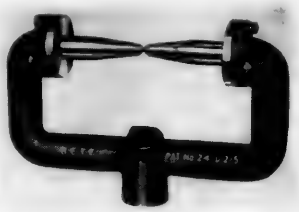
Certified ratings are based on the Standard Test Code for centrifugal fans adopted by the American Society of Heating and Air Conditioning Engineers and the NAFM. Tests were run in accordance with NAFM Standard Test Code for No. 1 Arrangement centrifugal fans.

More information? Circle Item 56 on postcard, page 155.

Opposed Jet Nozzles

A line of opposed jet, impingement type nozzles is announced by Bete Fog Nozzle, Inc., Greenfield, Mass.

The design of the interior of the nozzle tips produces a laminar flow at the point of impingement with a clear, laminar sheet being generated. This sheet, in turn, breaks up into fine droplets of uniform size. There are no internal parts to clog or wear, and the laminar flow through the nozzle tips reduces wear at that point to a minimum.

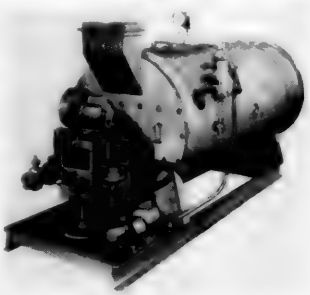


Called the O. J. Series, the nozzles are available in four standard sizes ranging in flow rate from 3 to 30 gpm. Pipe connections are ⅜, ¾, 1, and 1½ in.; overall dimensions are 6, 9, 12 and 18 in. Standard materials are bronze and aluminum. They can also be supplied, to special order, in stainless steel, Teflon, and other materials, as required for special purposes.

More information? Circle Item 57 on postcard, page 155.

Packaged Boiler Line

A line of Scotch type, steam boiler plants, called Red Band, is made by Eclipse Fuel Engineering Co., Rockford, Ill. Sizes range from 12 to 125 hp for gas or oil firing, or combined fuels, for process heating requirements.

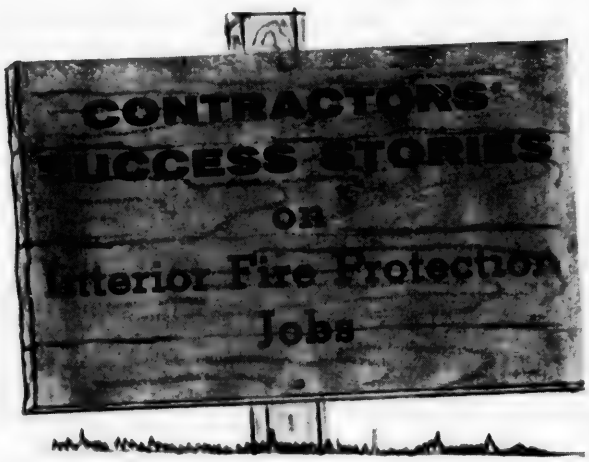


All the necessary valves, controls and boiler trim are mounted and internal piping and wiring is completed. When electricity, steam, water, and fuel lines are hooked up the boiler is ready to produce steam. Burner equipment is controlled automatically by steam pressure with a minimum of supervision by the operator.

The steam space in the boilers combined with a larger water storage gives sufficient reserve capacity to eliminate fluctuations in steam pressure and meet peak loads. Another feature is the internal furnace with 300% greater combustion volume to permit a high heat output without strain or danger of heat cracks. Heat conduction and convection is provided by 2-in. diameter tubes.

More information? Circle Item 58 on postcard, page 155.

(*Concluded on page* 136)



North East "Frankly, we've had no problem keeping busy. But I figured we could make out better and handle more jobs if we could find a line that would go in faster. We lost a lot of time waiting while other trades fitted openings to the valves or cabinets; also in placing or replacing glass. We tried Allenco. The cabinets fitted like custom-built; the glass went in in half the time. Allenco is like an extra man, without cost."

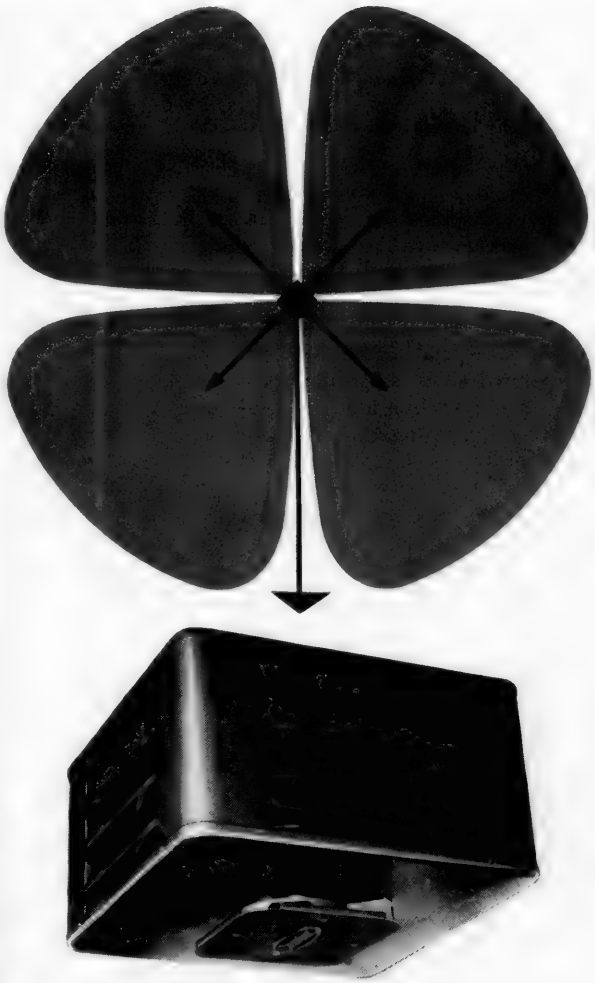
South Midwest "Our only problem in this field has been loss of men's time due to late delivery. When you're ready for fire-line valves or cabinets, and they're not there, you're wasting profit. I'd heard Allen wasn't fastest, but was reliable. That's true. You can bank on their delivery date. I know, now. In fact I bank *more,* now that I'm using Allenco."

West Coast "Our market is exceptionally cost-conscious. We got the habit of figuring the lowest-cost line. We got plenty of jobs, but our planned profit was eaten away by 'make goods.' We'd have to return and wait, or convert certain items on the job. Or cabinets would squeeze off-square. Then we began figuring on Allenco—sometimes it came a bit higher but we came out better. We still get all the work we can handle, and we net more with Allenco."

26 Principal Cities have Allenco branches. It will pay you to check with your Allenco man before you figure your next Interior Fire Protection job.

There's a reason why contractors prefer Allenco 3 to 2 over the next most popular line, why more buildings have Allenco than any other.

Look him up in your phone directory, or ask your wholesalers, or write direct to . . . W. D. Allen Manufacturing Co. – Allenco Building – Room 710 – Chicago 6, Illinois



"Clover leaf" air distribution covers 1/5 acre with heat

For heating coverage, you can't beat Carrier's exclusive "clover leaf" pattern of air distribution.

Just one of the new 4-way Carrier Unit Heaters will spread hot air over 8500 square feet of floor space. Better than 3 conventional fixed outlet projection-type unit heaters.

Simple adjustments vary the pattern. No outlet to change. No accessories to add.

Eight sizes for steam or hot water with ratings from 55,000 to 600,000 Btu/hr. Look in the Classified Telephone Directory for the name of your local jobber-distributor.

Carrier Knows Heating! Over fifty years of leadership in air conditioning have given Carrier unmatched experience in temperature control—heating and cooling! Carrier Corporation, Syracuse, New York.

Carrier

air conditioning · refrigeration
industrial heating

(*Concluded from page* 134)

Water-Cooled Room Cooler

A 1956 room air conditioner is placed on the market by Union Asbestos & Rubber Co., Chicago, Ill.

The unit, named the Royal Aire Jr., is the only room cooler manufactured by the company. The air discharge is now located at the front, instead of on the top, as it was on the 1955 model. Push-button controls are located behind a hidden panel, and the machine can be operated either as an air circulator or as a cooling unit. It is enclosed in an 18-gage, furniture style, steel cabinet, measuring 29 in. high, 19 in. wide, and 18 in. deep. It is finished in either brown or ivory.

Like the previous unit, the air conditioner can be moved from room to room by rolling on its rubber composition wheels. This enables it to be stored away when the cooling season is over.

Although water-cooled, the unit does not require permanent fittings and, if desired, water can be drawn from any household tap through a ⅜-in., flexible rubber tube similar to that used on a bath spray, or, it can be connected to copper tubing for a semi-permanent installation. An automatic water valve, which is standard equipment on all units, regulates the flow and insures that only the minimum amount is consumed.

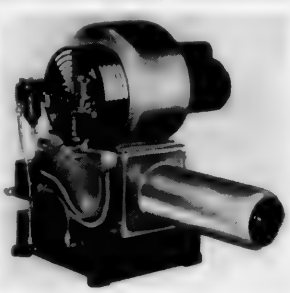
Condensation removed from the air by the cooling coil is automatically pumped out of the machine into a drain connection. In addition, the unit is equipped with a thermostat which can be adjusted by the user.

The unit weighs 155 lb and has a removable, permanent type filter that can be cleaned. Its maximum air flow capacity is 370 cfm, and, under normal operation, it delivers 320 cfm. The entire cabinet is lined with 1 in. of glass fiber insulation.

More information? Circle Item 59 on postcard, page 155.

No. 4 Fuel Oil Burner

A high pressure, gun type burner that will burn No. 4 and No. 5 fuel oil has been put on the market by Sun-Ray Burner Mfg. Corp., Jamaica, N. Y. The burner is suitable for apartment houses, schools, institutional, commercial and industrial buildings and heating processes.



Approved for No. 4 fuel oil by Underwriters' Laboratories, Inc., and by the Board of Standards and Appeals of the City of New York, the burner can be installed in any boiler or furnace. It can be used to replace existing No. 2 oil burners, with alterations in the piping.

The burner has a patented, built-in converter, called Thermas, which heats the higher viscosity oils so that they can be readily atomized and discharged through a conventional nozzle to burn with the characteristics of No. 2 oil. The fuel converter system has an automatic, electrically operated firing assembly with a safety shut-down and fuel cutoff.

A standard fuel pump, a pressure regulating valve, and a strainer provide the necessary suction from the fuel tank as well as the necessary pressure for atomizing the oil. No transfer pump is required unless there is an abnormal condition. The oil burner is available in three models: 3 to 6, 6 to 12, and 10 to 20 gph.

More information? Circle Item 60 on postcard, page 160.

Diaphragm Motor Valves

Diaphragm motor valves are available in direct acting (Series 657) or reverse acting (Series 667) types from Fisher Governor Co., Marshalltown, Iowa.

The units have a bolted-clamp type stem connection which allows a stem adjustment of 50% of the total travel in either direction. It will not shake loose from vibration or rotational inner valve forces, and it can be disconnected in the field without damage to the stem.

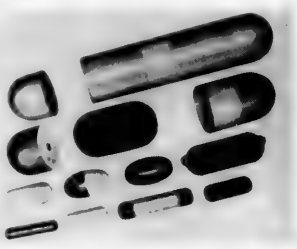
Diaphragm casings are made of drawn steel. The BunaN, molded diaphragms with Nylon inserts, retain their flexibility at low ambient operating temperatures and provide a linear relationship between instrument signal and travel. The yoke-to-body connection is a forged steel hammer lug nut.

The stuffing box is also a bolted clamp type with Teflon packing. The topwork may be removed without disturbing the stuffing box. The stainless steel travel indicator is calibrated in percent of valve travel.

More information? Circle Item 61 on postcard, page 155.

Floats Have Bulkheads

A line of plastic floats, designed for industrial applications, is announced by J. H. Shepherd Son & Co., Elyria, Ohio. The floats are recommended for applications in dairies, poultry and livestock watering devices, tanks, and water heaters where temperatures do not exceed 160 deg F.



Bulkheading between the individual sections of the floats is a design feature that permits rough usage at extreme pressures.

The floats are available in many shapes and sizes and are made smooth to prevent foreign substances or growths from adhering to the surface. Permanent colors, when required, are an additional feature. Many connection styles are available, and many floats or the required connection methods, or both, are made to the buyer's specifications.

More information? Circle Item 62 on postcard, page 155.

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NEWS OF THE MONTH

OPTIMISTIC FORECASTS FOR '56

indicate continued high output and sales. Heating and air conditioning executives see big year ahead.

Secretary of Commerce Sinclair Weeks has announced that a year-end survey of major industries indicates most of them will continue operating at or close to peak levels through the first six months of 1956.

Secretary Weeks said the survey was conducted by the 25 Industry Divisions of the Department's Business and Defense Services Administration, of which Charles F. Honeywell is administrator.

The BDSA estimates follow:

• **IRON AND STEEL.**—The momentum of record-breaking steel production during the last half of 1955 will carry forward into the new year and make the first half one of the highest, if not the highest, in history. Any shutdowns required for repairs during the next six months will be offset by the addition of new facilities.

These increased facilities will help, but not overcome, the tight supply situation. Indications are that most steel products will remain in short supply through the first half, with the tightest products being plates, sheets, strip, structurals, and certain bars and tubular products. Large carryovers have necessitated adjustments in first quarter order books to permit a catching up with 1955 commitments. It is reported that the order books are solid through the first six months.

Nickel will remain in short supply and will limit the production of nickel-bearing alloys, including stainless steel, below the growing demand for these metals. This will not, however, affect the over-all output of steel production.

• **ALUMINUM.**—Shipments in the first half of 1956 are expected to be at an annual rate of 4.6 billion pounds, a new record high and about 18% higher than the first half of 1955 and about 7% above the last six months of 1955. Total aluminum shipments for 1955 are now estimated at 4.1 billion pounds, a record high and about 36% above 1954.

• **COPPER.**—Supplies will continue short in the first quarter, but it is anticipated that they will approach demand in the second quarter, when new production should add about 7,000 tons a month to the domestic supply. However, certain producers of refined copper are obligated to deliver to Government account by June 30, 1956 about 18,000 tons which were deferred in the final quarter of 1954 and the first two quarters of 1955.

• **CONSTRUCTION.**—New construction expenditures for 1956 are now estimated at $44 billion, 5% above the $42 billion all-time record indicated for 1955.

Residential building (new private non-farm housing starts) are estimated at about 1.2 million, or 100,000 fewer than in 1955 and 200,000 less than the record established in 1950.

Estimated 1956 expenditures for stores and other service establishments, many in new suburban developments and along expanding highway networks, are expected to approximate $2.250 billion, or 17% above the 1955 total and 80% above that for 1954. A record $850 million is in prospect for religious buildings in 1956.

• **MINARD.**—An increase in air conditioning equipment sales in 1956 over 1955 levels may substantially outstrip the generally predicted rise in construction activity, the president of The Trane Company believes.

"There is usually a high correlation between construction activity and air conditioning sales," said D. C. Minard. "But in 1956, with an anticipated jump of up to 10% in nonresidential construction, the industry's air conditioning sales should rise as much as 15 to 20%."

Mr. Minard cited three factors he said will give extra stimulus to air conditioning equipment sales in 1956:

(1) More new buildings than ever are being air conditioned.

(2) The rate of air conditioning existing buildings is rapidly accelerating.

(3) Air conditioning in industrial plants for both industrial process and worker comfort purposes is an expanding, if relatively new, major market.

A substantial factor that will tend to push Trane business up in 1956, Minard said, will be the introduction of a number of new products, particularly in air conditioning, that will broaden the company's present markets. He disclosed that the firm will be much more active in the commercial packaged air conditioner market in 1956, with the introduction of a line of self-contained air conditioning units which has been completely redesigned.

• **WAMPLER.**—Another record sales year will be established by the air conditioning industry in 1956 with a total retail volume of about $3.2 billion, it was predicted by Cloud Wampler, chairman and president of Carrier Corporation, in a year-end review. The air conditioning industry spokesman said that it would be the seventh consecutive record-breaking year. By way of comparison, he estimated the industry's 1955 retail sales at $2.9 billion.

As in the past three years, the biggest percentage gain in 1956 will again occur in the residential field, he stated.

"Sales of central systems which air condition the entire home have risen from 50,000 installations in 1953 to about 75,000 in 1954 and 125,000 in 1955," Mr. Wampler said. "The total going into homes in 1956 should be about 200,000 systems with a retail value of about $1/3 billion."

Important advances in other markets and special segments of air conditioning industry were also predicted by the chief executive of Carrier. The air conditioning of department stores and shopping centers, older office structures and new buildings is proceeding at a pace which is not likely to slacken for years to come.

"Another market due to show substantial early improvement is the air conditioning of existing hotels, following the same competitive pattern as in office buildings. And the industrial plant market—stimulated by automation, which has important connotations for air conditioning—offers the industry its greatest single long-range potential next to that of homes."

Mr. Wampler pointed out that virtually all plants employing extensive automation will require air conditioning

(*Continued on page* 140)

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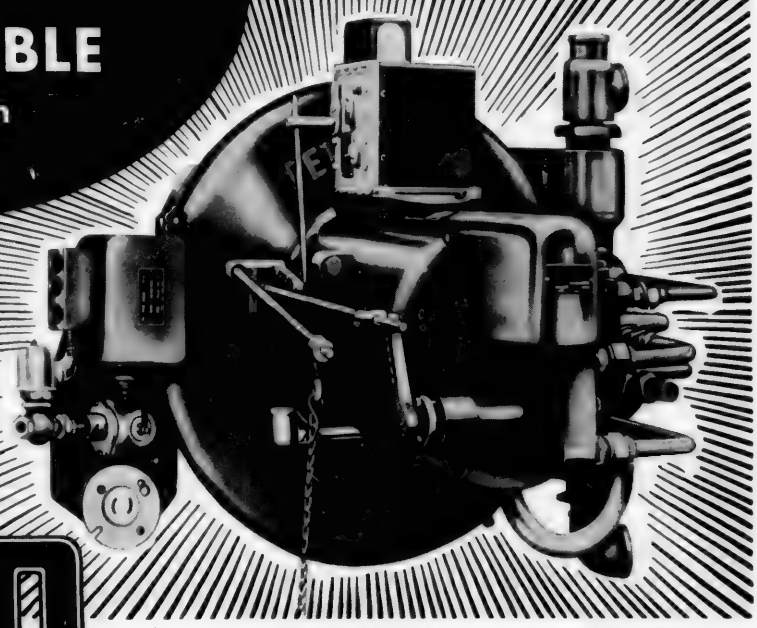
in operation



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CAPACITIES FROM 8 TO 200 GALLONS PER HOUR

ROTARY OIL BURNER

for economical heavy oils

Why PETRO is known for DEPENDABILITY

Petro engineers are not gadget minded. They like oil burners that are sturdy and steady because that is what users like, with no hairline adjustments required for good operating efficiency.

Take oil handling, for instance. Viscosity of heavy oil isn't nearly the bugaboo it's supposed to be. Everyone knows that heavy oils can be as sticky as January molasses, or as thin as hot syrup. But that is only half the story. The other half is that at operating temperature viscosity is a negligible factor. From 160° on up it changes hardly at all. (See chart.)

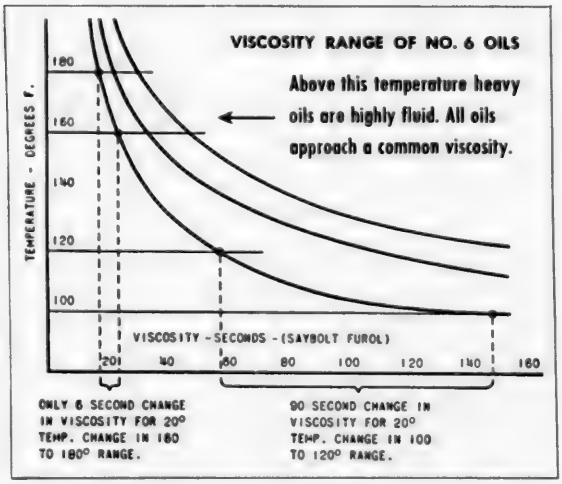
So the solution is simple. It's easy to keep the oil above the critical temperature, and not expensive either. The Petro burner has a simple valve that will not pass the oil to the nozzle before it reaches a predetermined temperature. If the oil is below operating temperature it is recirculated through the heater. On a cold start this requires about seven minutes. On restarts there is practically no time lag.

Proper heating of the oil has these advantages

1. Oil can be *accurately* metered; **2.** Oil is subject to finer atomization. (It separates into much smaller particles for better aeration and cleaner burning); **3.** Warm oil ignites quickly and easily; **4.** Petro *never* has a slug of cold oil in the feed line to the burner, which is the main cause of smoky starts.

From all of this you would expect low fuel and maintenance costs —and on this point thousands of Petro owners will bear us out.

PETRO will see you through — you can bank on it



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Company_____

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OPTIMISTIC FORECASTS

(*Continued from page* 138)

to assist in maintaining proper operation of the complicated machines, as well as to provide for the comfort and efficiency of employees.

The Carrier executive predicted that room air conditioner retail volume in 1956 would total around 1,450,000 units valued at about $435 million as against 1,400,000 conditioners sold during the year just closed.

• **OLSEN.**—"It is my own personal conviction, as well as that of the joint managing body of Armstrong Furnace Company, that 1956 is going to be a year that will surpass any to date for Armstrong in the sale of residential furnaces. Couple this with an estimated doubling of the market for summer air conditioning, most of which will be installed by furnace men, and there is no doubt that the industry is looking forward to a banner year." Thus spoke W. J. Olsen, president and general manager, Armstrong Furnace Co., during his company's annual sales meeting in Columbus, Ohio.

• **CORNELL.**—"In attempting to predict business levels for 1956, it is a temptation to straddle the fence and say: Good for the first half, somewhat off after that. Most of the current forecasting opinion runs that way, it seems," says F. S. Cornell, executive vice president, A. O. Smith Corp., Milwaukee, Wis. "We at A. O. Smith have to do better than that, however, because our sales and capital expenditures planning must be based on longer time periods I think that we have all the ingredients required for a full good year in 1956.

"After considering the strong position of manufacturers' backlogs as well as indicated plans for new plant and equipment expenditures," Mr. Cornell continues, "the industrial production index ought to be about 143 by June of 1956, compared to 139 for June of 1955. And in spite of the pressures now being exerted, I don't look for too much of an increase in wholesale prices. By June of 1956 I think the index will be about 111.8 compared to 110.3 in the year earlier. And as far as the stock market is concerned, I believe it will reflect the fundamentally healthy condition of our economy by continuing to move upward."

• **VELTFORT.**—Many informed persons in the copper industry are expecting that there will be a balance between the supply and demand of copper during the first quarter of 1956, according to T. E. Veltfort, manager of the Copper & Brass Research Association. A few people even believe there may be a slight surplus of supply over demand by the middle of the year. Naturally, these predictions are predicated on the assumption that there will be no serious strikes or other interruptions in production, such as occurred during the past two years.

This optimistic outlook is based on the fact that increased supplies of copper are expected to become available early in the year. Development of new mining properties and expansion of existing mines—projects that require years rather than months—will bring an increasing amount of copper to the market. It is expected that this copper unit will increase month by month at least for the next three years.

In considering the copper situation it is necessary to keep in mind that copper is produced in every continent of the world, although the three principal producing countries are the United States, Rhodesia and Chile. Thus, the copper supply available to the United States may be affected by events in another part of the world. In addition, copper is an international commodity and the supply and demand picture must be viewed from a world-wide rather than a domestic standpoint.

• **MITCHELL.**—The past year was one of the most successful in the history of the gas utility and pipeline industry, according to Dean H. Mitchell, president of AGA. During 1955 the industry reached new record highs in numbers of customers served with utility gas, in volume of gas sold to ultimate consumers and in revenues received from the sale of gas. Reserves of natural gas at the beginning of 1955 were at an all-time high, despite a new record production figure in 1954. The industry added more than one million new customers during 1955.

Natural gas systems are continuing to spread into new areas and to augment supplies in residential and industrial areas now served. With the completion of the Pacific Northwest pipeline, only two states in the nation will not be receiving natural gas. Expanded use of underground storage is making it possible to serve more customers with a minimum increase in distribution facilities.

After a careful review of the present record figures and the factors that were responsible for the successful achievements of 1955, most members of AGA predict another record year in 1956.

• **ROCKWELL.**—The number of gas utility customers topped 29 million in 1955. It will approximate 30 million in 1956, and the number of LP-gas users will raise the total of all types of gas customers to about 37 million by the end of the year, predicts W. F. Rockwell, Jr., president of GAMA. New peaks in gas usage are sure to be reached in homes, in industry and in commercial establishments and institutions.

As a result manufacturers of all types of gas appliances and equipment will enjoy a favorable sales climate and are likely to top their banner performances of 1955—with water heaters, furnaces and ranges leading the way.

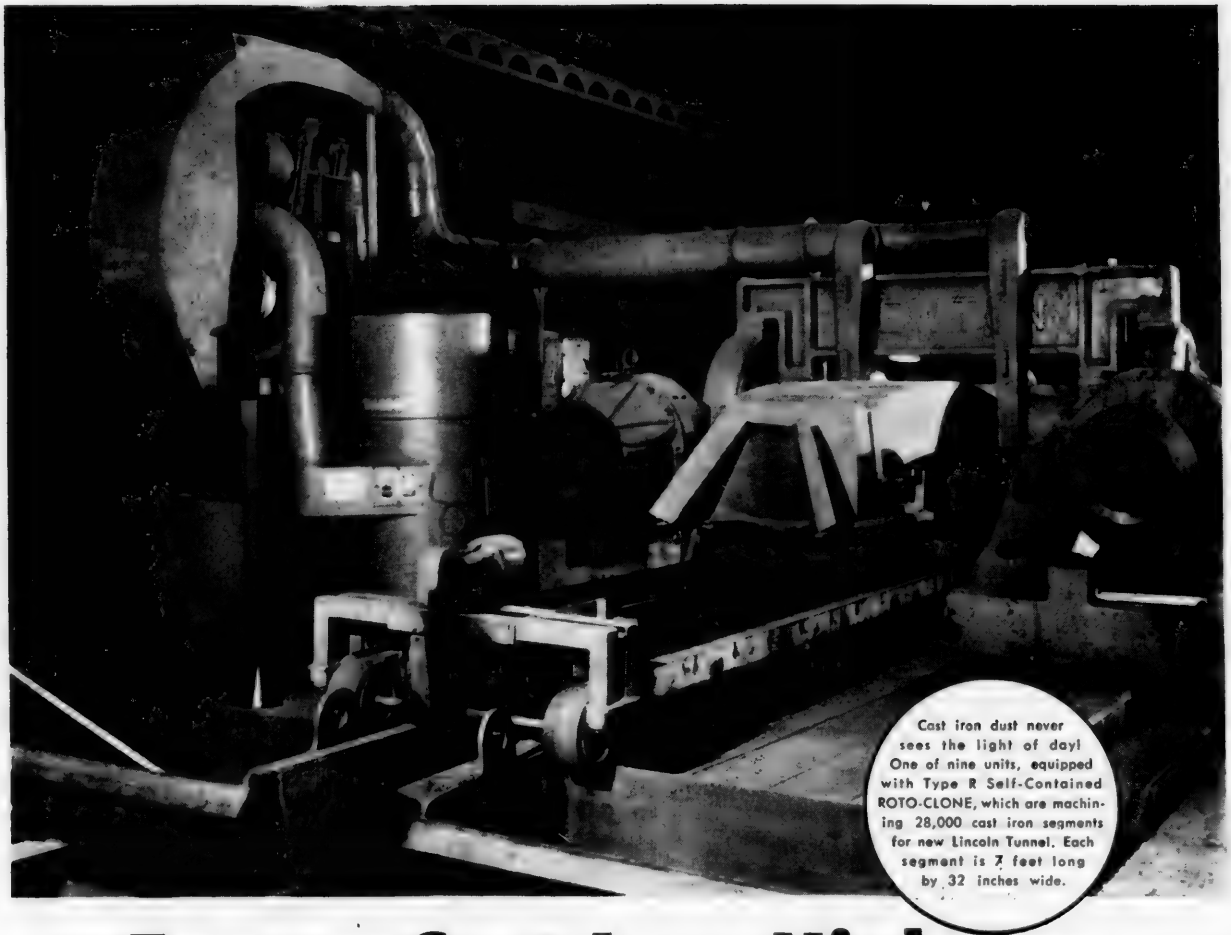
Manufacturers of automatic gas water heaters shipped 2,799,000 units in 1955. This was an all-time high and was 22.7% above the 1954 total. Makers of gas warm air furnaces enjoyed an even more spectacular 1955 than the water heater manufacturers. They shipped 850,000 units, nearly 30% above the 1954 total, another all-time high. Gas boiler makers, too, profited by the trend to gas heat, increasing their shipments 13% above the 1954 total.

AIR CONDITIONING MARKET

is reviewed with respect to its present penetration and future potential at recent Syracuse meeting.

The largest potential market for air conditioning is in the industrial field which, according to Charles V. Fenn, vice president, Machinery and Systems Division, Carrier Corporation, represents only 1% market saturation. Figures were also presented to show what has been done and what the potentialities are in various other fields.

(*Continued on page* 142)



Cast iron dust never sees the light of day! One of nine units, equipped with Type R Self-Contained ROTO-CLONE, which are machining 28,000 cast iron segments for new Lincoln Tunnel. Each segment is 7 feet long by 32 inches wide.

Even a Cast Iron Highway Has Its Dust Problems

LINCOLN TUNNEL'S third and newest traffic tube under the Hudson River will literally be a cast iron highway—a mile-long highway formed by placing 2000 giant cast iron rings side by side. Each ring, measuring 31′ in diameter by 32″ wide, consists of fourteen 7′ long segments which are assembled at the job site.

2000 x 14 = 28,000 segments that must be carefully machined to insure precision assembly. Here was a cast iron dust problem of "king size" proportions. But AAF had a ready-made solution, proved on scores of similar installations—the Model R Self-Contained ROTO-CLONE.

Now, cast iron dust is always "under wraps". Through integrated control, the Model R successively removes (1) the chips in a precleaner, (2) then the coarser dust particles with a Type D ROTO-CLONE, and (3) finally the fine float cast iron and graphite with a Cycoil Oil Bath Scrubber. Final result—this air, when returned to the work room, is cleaner than that of the surrounding area.

AAF's 23 years of dust control experience penetrates every industry—covers thousands of successful applications. That's why the local AAF representative is your logical point of contact on all problems of dust control. Call or write him now.

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— BETTER AIR IS OUR BUSINESS —

Herman Nelson Unit Heaters

Herman Nelson Unit Ventilators

AIR CONDITIONING MARKET

(*Continued from page* 140)

• **OFFICE BUILDINGS.**—Shortly after World War II virtually every major new office building was completely air conditioned at the time of construction, and the majority of these have used centrifugal refrigerating machines to provide the cooling.

An overall picture indicates that ¾ of the total business in the large air conditioning and refrigeration field is represented by the following types of business: New office buildings, existing office buildings, hotels, hospitals, apartment houses, laboratories, department stores, shopping centers and industrial air conditioning. An examination was made of this ¾ figure and Mr. Fenn reported that the largest single category of new business during the year 1955 was in existing office buildings which accounted for more than ⅓ of the total orders booked. There is no business in the air conditioning of existing office buildings in Dallas or Houston, Texas, as the saturation there is literally 100%.

It has become fairly well established that when 18 to 20% of class A office space has been air conditioned, then all remaining buildings in that city must sooner or later air condition in order to maintain their class A status.

• **APARTMENT HOUSES.**—It may be of interest to note that roughly ⅛ of the existing dwelling units air conditioned are in apartment houses. Apartment house space, like office building space, was scarce immediately after the war but there has been a tremendous amount of house and apartment building construction in the past decade. The man who builds an apartment house today must air condition it to keep his investment competitive.

• **HOTELS AND SHOPPING AREAS.**—Until the last few years, there has been virtually no major hotel construction since the beginning of the depression. In this country there are more than 600 hotels with 300 rooms or more, exclusive of resort hotels. It is believed that the air conditioning business in this market is almost $500 million.

During the past decade there has been a great volume of home construction in suburban areas and as a result there has been the development of suburban shopping centers, some modest in size and some nearly as extensive as the Northlands center in Detroit which cost more than $25 million to build. As these suburban shopping centers develop, so too is the growing force for large downtown stores to provide modern facilities to compete with this new competition.

• **INDUSTRIAL PLANTS.**—The most exciting market of all is the industrial plant. Although there is a tremendous amount of office building space there is from 25 to 50 square feet of factory space for every single square foot of office space. As an example of what can be expected from the entire textile field, one 18,000 spindle mill that was air conditioned required 1200 tons of refrigeration. In the United States there are approximately 18 million total spindles in the industry and if 100% of this industry added refrigeration, 1,200,000 tons would be required. Up to date only about 100,000 tons have been installed which means that this market is perhaps 8 to 10% saturated.

To present an additional comparison of how industrial air conditioning presents a greater market than the conventional air conditioning of office buildings, let us again examine the textile plant. In the spinning or twisting area, the heat load that would be absorbed by air conditioning is roughly 5.25 times per square foot what it is in a typical office building. In a weave room where the yarn is made into cloth, the load is approximately 2¼ times as much. In other areas of the textile plant, machinery and lights make the load approximately 3 to 3.5 times as much as would exist in an office building.

• **PREDICTIONS.**—There has been this lag in industrial air conditioning because, due to the large amount of heat that must be removed, such systems are much more expensive than other types of air conditioning.

As a starting point, the total existing office building market, including buildings already conditioned as well as those yet to be conditioned is 3.5 billion. Mr. Fenn pointed out that over the next ten years in the field of large air conditioning and refrigeration, and by that is meant systems 100 tons and larger, the industry will do a retail volume totaling about $10 billion. The 1956 volume is expected to be $600 million; the 1960 volume, $850 million and the 1965 volume, $1.3 billion.

AIR STERILIZATION

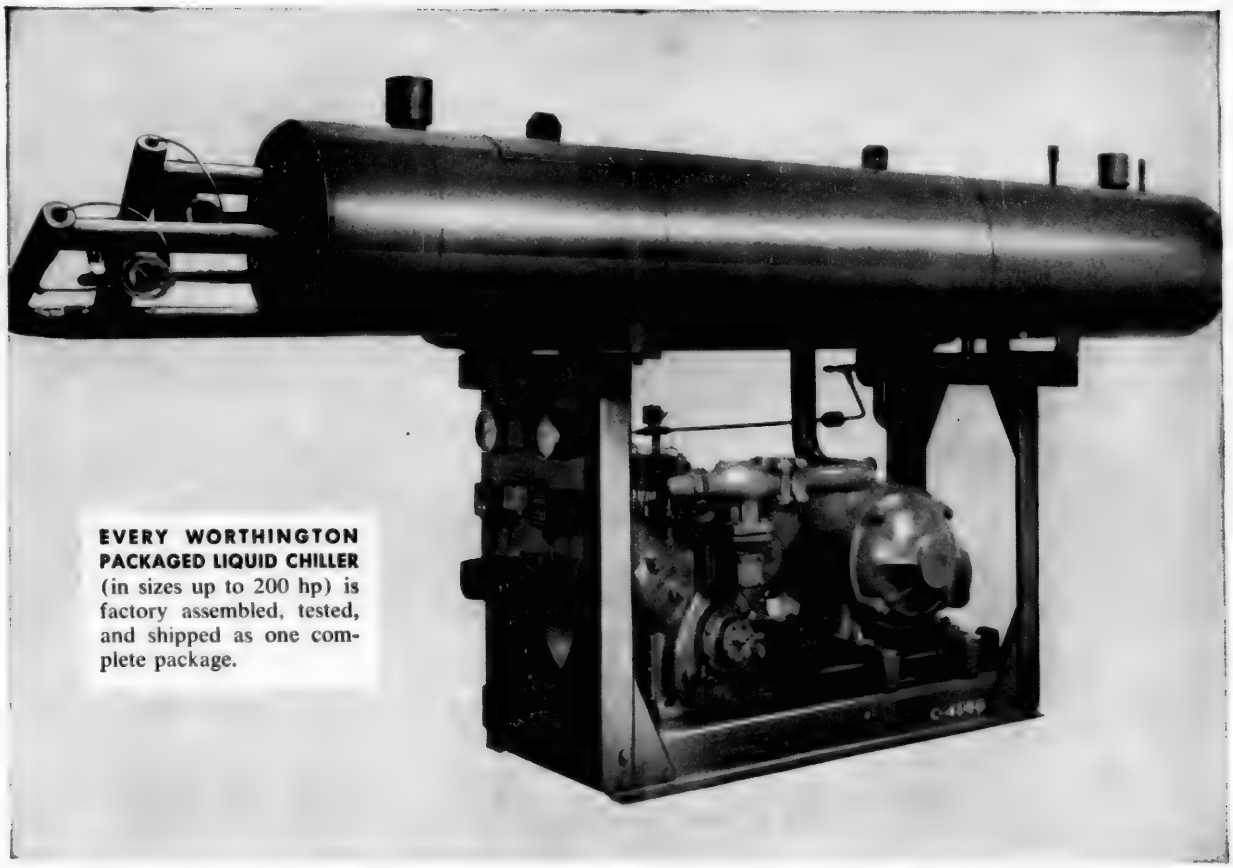
at home a possibility as engineers report 50% reduction of room air bacteria by means of electric heat.

Incandescent electric heaters can reduce the microbial content of room air in homes by as much as 50% during the heating season, it was reported at the Winter General Meeting of the American Institute of Electrical Engineers in the Hotel Statler.

Although the application of these commercially available heaters is limited to the winter months when heat is desired, the microbial content of room air is greatest during this period, J. C. Beckett, of Wesix Electric Heater Co., San Francisco, and C. E. Clifton, Stanford University, Stanford, Calif., pointed out in a paper, Heat as a Means of Air Purification, presented during a session on domestic and commercial applications.

• **STERILE AIR.**—They said that their studies support the contention that high temperature heaters such as the more conventional incandescent electric heater exert a considerable bactericidal and sporicidal effect. In operation in the home the rates of reduction of airborne micro-organisms generally were in the order of 50% per hour for the more resistant spores. Where these electric heaters are the principal source of heat for a given home or room, it is reasonable to expect that the micro-organism content will reach a very low level after several hours operation. It is clear that a considerable portion of the air which circulates around the heater may not soon pass close enough for the organisms contained therein to be destroyed. It takes several hours operation to achieve a stable minimum condition. The germicidal action appears to be much more rapid than that observed with ultra-violet lights as ordinarily placed in a room but not as fast as with the use of a chemical material such as propylene glycol vapor.

(*Continued on page* 144)



EVERY WORTHINGTON PACKAGED LIQUID CHILLER (in sizes up to 200 hp) is factory assembled, tested, and shipped as one complete package.

Low-cost operation, easy installation . . .

you get both with Worthington's new packaged liquid chiller

If you're interested in process cooling, refrigeration, or air conditioning, take a long look at these six big advantages of the new Worthington packaged liquid chillers:

LOW-COST OPERATION — Simple variable capacity control exactly matches load requirements — results in unusually economical operation.

EASY INSTALLATION — All units are shipped completely assembled. Only simple foundations are needed.

FACTORY ENGINEERING — You benefit from Worthington's undivided responsibility. The entire unit—compressor, chiller, drive and controls—comes in one Worthington-supplied package.

MINIMUM FLOOR SPACE — Efficient, compact design means greatly reduced space requirements.

LONG LIFE — over a million dollars worth of research went into Worthington's Freon compressor — all aimed at making it the most durable unit ever.

WIDE SELECTION — No matter what you want to chill — water or brine — you can get a Worthington packaged liquid chiller that's exactly right for the job. Sizes from 7½ all the way up to 200 hp.

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WORTHINGTON

Climate Engineers to Industry, Business and the Home

Top performance from a Worthington Packaged Chiller in their first building convinced the management of Azure Tides Motel. They're putting a second Packaged Chiller in their new addition.

Architect: Frank C. Martin, Sarasota, Fla.; *General Contractor:* Charles Ongheri, Sarasota, Fla.; *Mechanical Contractor:* J. H. Cobb, Sarasota, Fla.

(*Continued from page* 142)

MERGER RESULTS

disclosed at a meeting held by National-U. S. Radiator. Consolidation has streamlined sales and manufacturing efforts and broadened lines.

Results of the merger of National Radiator Company and United States Radiator Corporation into the National-U. S. Radiator Corporation, which took place April 1, 1955, were disclosed to the business press at a meeting held by the merged company at its headquarters in Johnstown, Pa., on January 11.

• **BENEFITS.**—Among the benefits of the merger were (1) improvement in manufacturing efficiency through plant consolidation and elimination of excess capacity; (2) elimination of duplicate effort in engineering; (3) consolidation of sales offices and sales forces, particularly in the heating field, with resulting economies and more effective overall sales coverage; (4) broadening of heating products line through selection of complementary products from lines of both former companies, and (5) elimination of many duplications in administrative fields.

• **MANUFACTURING.**—The number of manufacturing plants has been reduced from 15 as of April 1, 1955, to 11 as of the end of 1955. Plants still operating include those in Cleveland, Duncansville, Pa., Edwardsville, Ill., Geneva, N. Y., Johnstown, Pa., Los Angeles, Middletown, Pa., New Castle, Pa., Oswego, N. Y., Waukegan, Ill., and West Newton, Pa. Manufacturing is under the direction of Senior Vice-President J. C. Haas.

• **RESEARCH.**—The Engineering and Research Department, consisting of 100 persons and headed by Senior Vice-President L. N. Hunter, is a consolidation of the engineering departments of National and U. S. This department includes a section on research planning, one on metals research, and an executive engineer and staff, as well as the largest section, the Heating and Air Conditioning Division, of which K. O. Schlentner is manager.

• **SALES.**—Major consolidations of sales offices are essentially completed. Sales Division headquarters, all under the direction of Senior Vice-President C. M. Baumgardner, are located in several cities.

• **DIVISIONS.**—In addition to the businesses formerly conducted directly under either the National or U. S. name, there are separate sales divisions, also headed by Mr. Baumgardner, including the following: Cyclotherm (packaged boilers), Oswego, N. Y.; Drayer-Hanson (air conditioning), Los Angeles; Pacific Steel Boiler, Johnstown, and Viking Air Products (air handling), Cleveland.

The Heat Transfer Division sales office is located in New York. The Special Products Division, currently manufacturing J-57 jet engine manifolds, is in Johnstown, as is the Plastic Metals (powdered metal) Division.

• **OVERALL.**—Administrative headquarters have been consolidated in Johnstown, Pa., and the former Detroit offices of U. S. Radiator have been closed.

According to T. B. Focke, president, consolidated net sales of the corporation for the six months ended September 30, 1955, amounted to $28,239,331. Current assets of nearly $21 million are 3.1 times current liabilities of over $6.6 million.

Key personnel, in addition to those named, include J. W. LeRoy, assistant to senior vice president for sales; C. H. Austin, assistant to vice president for sales; Sigmond Moroh, manager, air conditioning and warm air section; R. S. Doherty, manager, packet and Super-Pak sales; R. O. Shelkey, manager, finned surface heating products; H. J. Muhlitner, manager, heating accessories; H. L. Andrews, director, market research; J. W. Hall, director, advertising and sales promotion; C. J. Philage, advertising manager; Edward J. Grady, vice president, sales, Pacific Division; H. M. Gibb, sales manager, Pacific Division; P. M. Sarraiocco, executive engineer; B. C. Brown, manager, air conditioning engineering; Dr. W. L. Ross, manager, development laboratory; Dr. W. M. Shafer, manager, metals research division; and W. W. Popyk, manager, engineering service department.

E. K. WEBSTER

retires as senior vice president of New Jersey firm.

E. K. Webster, senior vice president of Warren Webster & Co., Camden, N. J., manufacturers of heating and cooling equipment, retired from active service with the company on December 31st. He will continue as a member of the board of directors.

Mr. Webster has completed 45 years of continuous service with Warren Webster & Co. During that time, his knowledge of the heating industry and his constructive role in the firm's management have played a large part in the success of the company.

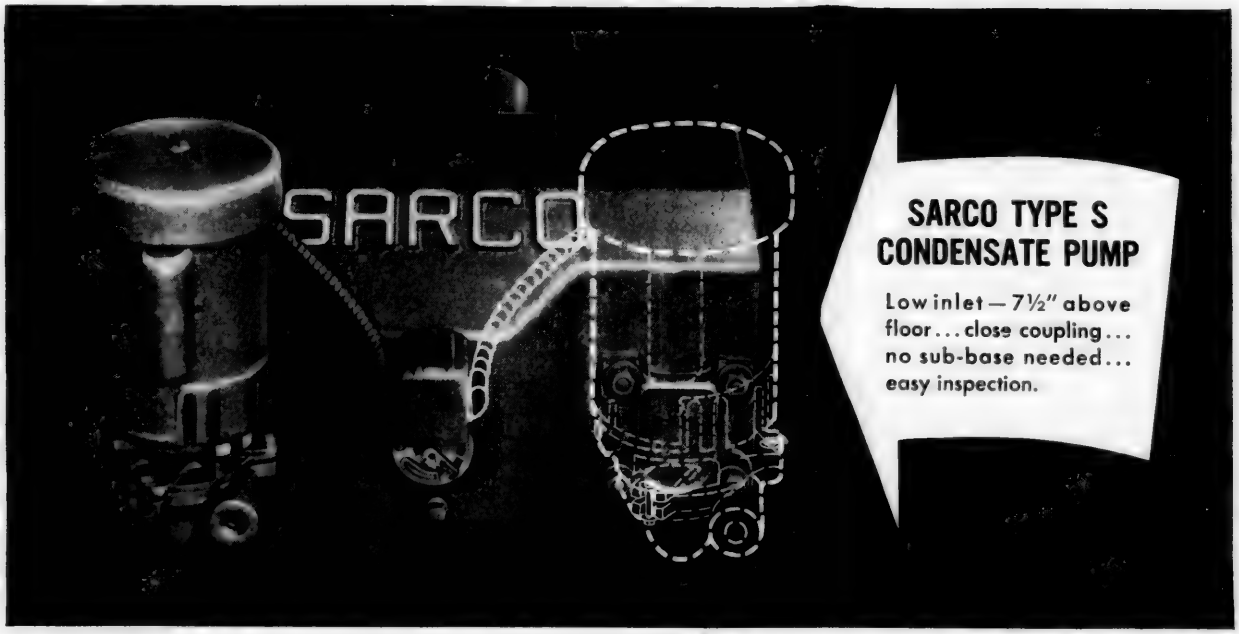
A. R. Webster

E. K. Webster

A. Richard Webster, whose grandfather founded the company and whose father, Warren Webster, is its president, has been named to the new office of executive vice president. In this position, he will coordinate all activities of the company's divisions and direct the detailed activities of Webster's program for new and improved product development.

The new executive vice president joined the Webster organization in 1953 and has served as vice president, engineering and production, since 1954. He had previously attended Amherst College and Drexel Institute of Technology, and completed four years of active service in the U. S. Navy.

(*Concluded on page* 146)



Sarco Condensate and Vacuum Pumps give you this big advantage...

UNDIVIDED RESPONSIBILITY
by Sarco for pumps as well as heating specialties!

Now Sarco expands its extensive heating line... by adding *condensate and vacuum pumps*... offering you in still larger measure the protection and convenience of *undivided responsibility*.

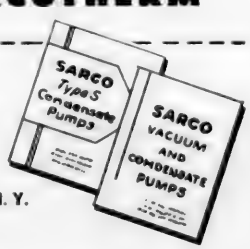
Shown above is one of the many Sarco pumps... it's the streamlined Sarco type S condensate pump. Designed and built to Sarco's traditionally high quality standards, it assures you top performance and long, trouble-free life. The many advantages include:

...Low 7½" inlet... Close coupling... No sub-base needed. Inspection? Just unscrew 3 nuts and lift the motor; no need to disconnect the piping. For a complete list of features, mail the coupon today.

Selection — The experienced Sarco-Sarcotherm engineering staff will gladly help you select the right Sarco condensate or vacuum pump for each job.

Undivided Responsibility — From *one* reliable "Complete Line" source... SARCO-SARCOTHERM ...get not only condensate and vacuum pumps but also heating specialties, steam traps, temperature regulators, finned-tube radiation, and weather-compensated control systems for steam and hot water heating.

SARCO—SARCOTHERM



MAIL COUPON FOR THESE BULLETINS

Sarco Company, Inc.
Sarcotherm Controls, Inc.
Empire State Bldg., New York 1, N. Y.

Please send me:

☐ Bulletin on New Sarco type S Condensate Pumps.

☐ Bulletin on all Sarco Vacuum and Condensate Pumps.

Name_____
Firm_____
Address_____
City_____ State_____

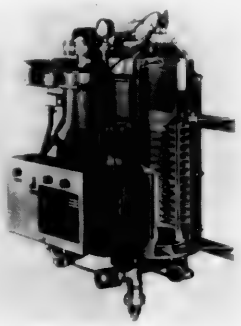
2150-B

(*Concluded from page* 144)

AEROTRAIN HEATERS

provide compact oil fired booster unit for car's liquid heating system with electric immersion heaters.

In one of the side compartments under each of the ten passenger cars in both of the new GM Aerotrains is an automatic oil-fired hot water heater made by Vapor Heating Corp., Chicago. Thermostat controls cause the heaters to supply additional heat whenever more heat is needed than is supplied by the electric immersion heaters in the liquid heating system in the cars.



• **CAPACITY.**—These automatic Vapor hot water heaters put out from 125,000 to 150,000 Btu per hour. They were developed to keep diesel locomotive engines warm during overnight non-operating hours, to save fuel and engine wear resulting from long hours of idling the engines when the locomotives are not working.

Heaters have a high output and yet are small enough to fit into small compartments. The forced draft fire burns in an Inconel fire-pot, hot gases from the fire transfer heat to the water as it is pumped through the two water jackets. Steel rings with jagged teeth are welded to the water jackets in order to transfer the heat more effectively in a limited space. An electric spark lights the diesel oil fire. Fuel pump, forced draft motor, and all controls are incorporated into this small package.

PLASTIC PIPE

for home-plumbing has first use in model school.

Plastic pipe is getting a tryout for house-plumbing in a model school building erected on the Ann Arbor campus of the University of Michigan by its College of Architecture and Design.

Made of a new high impact, rigid Koroseal material, the new non-metallic pipe is tough and durable.

Plastic pipe gets screwed coupling.

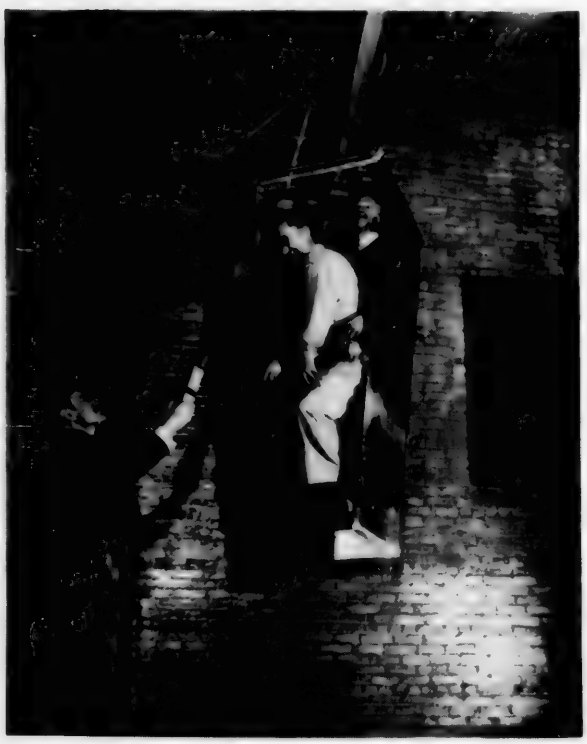
• **SERVICE.**—Laid underground, the pipe conducts cold water from the main line to the school building which is a full scale model for a standardized system of low cost school construction. The model structure, which serves as a research laboratory for the college, was designed for utmost durability and incorporates new construction features which provide for easy expansion and disassembly for re-use.

The pipe, produced by The B. F. Goodrich Company Industrial Products Division, is furnished with threaded fittings and assembly requires no special skill or tools.

• **WALLS.**—The same high impact, rigid Koroseal material, prepared in sheets measuring four feet by four feet, is used in the model school to panel the walls of the work shop area and serve as partitions between offices. One-quarter inch thick and grey in color, the rigid Koroseal sheet protects the walls against impact damage. Standard sheets measure four by eight feet.

Illuminated ceilings provide the building's interior lighting. Clear Koroseal sheet is used to form a translucent ceiling through which fluorescent fixtures diffuse their light.

FOIL LAMINATE IN STRENGTH TEST



A single thin sheet of laminated aluminum foil of a new multiple aluminum insulation, proved it could really take abuse when it lifted 6 stalwart men and a heavy platform . . . 941 pounds, high off the ground. Emile Fogelson, chief engineer of Infra Insulation Inc., who conducted the test, estimated that this single sheet could support the weight of more than 10 men . . . 1800 pounds. The new tough barrier to heat and vapor flow is called Infra Type 6PShLL and 4PShll. Its aluminum surfaces are said to have 97% reflectivity for heat rays. This laminated foil is incorporated into an insulation prefabricated into multiple layers of aluminum, fiber and air spaces.

Crashing the 100 ton barrier

with KRAMER UNICON

in semi-tropical climate

UNICON SUCCESSFULLY MET THE TEST THROUGH THE SEVERE SUMMER OF 1955

You, too, can crash the big tonnage barriers with UNICON, the industry's finest remote-type air-cooled condenser. Put Kramer's 18 years of "treasured know-how" in the proper use of air as a condenser coolant to work for you.

Photo of Kramer UNICONS mounted on roof of Handy-Andy Supermarket in San Antonio, Texas, used with 100 ton air conditioning system. Supplied through United Supply Co., of San Antonio and installed under the direction of Harold Vogt.

Write for Bulletin U-210-L

KRAMER

KRAMER TRENTON COMPANY
Trenton 5, New Jersey

DEGREE-DAYS FOR DECEMBER, 1955

(A) Airport readings; (C) City office readings; (O) Readings at a point on outskirts of city.

AIR CONDITIONING, HEATING AND VENTILATING'S 28th Year of Publication of Monthly Degree-Day Data

City	December			Season to December 31, incl.*		
	1955	1954	Normal	1955-56	1954-55	Normal
Abilene, Texas (A)	576	482	595	1026	856	1098
Albany, New York (A)	1377	1142	1197	2759	2406	2559
Albuquerque, New Mexico (A)	764	889	899	1492	1526	1757
Alpena, Michigan (C)	1302	1233	1218	2892	2697	2827
Anaconda, Montana (C)	1323	1175	1238**	3463	2843	3171**
Asheville, North Carolina (C)	845	859	769	1733	1823	1633
Atlanta, Georgia (A)	664	652	614	1235	1257	1125
Atlantic City, New Jersey (C)	992	857	831	1732	1589	1597
Augusta, Georgia (A)	611	594	494	1145	1156	835
Baltimore, Maryland (C)	958	845	812	1749	1553	1537
Billings, Montana (A)	1305	944	1172	3136	2262	2739
Binghamton, New York (C)	1289	1102	1113	2557	2302	2417
Birmingham, Alabama (A)	607	652	596	1242	1228	1128
Bismarck, North Dakota (A)	1820	1237	1535	4067	2964	3458
Block Island, Rhode Island (A)	1115	889	927	2079	1784	1936
Boise, Idaho (A)	912	1062	1054	2342	2274	2340
Boston, Massachusetts (A)	1181	941	998	2258	1908	2008
Bozeman, Montana (C)	1321	1238	1293**	3438	2875	3286**
Buffalo, New York (A)	1229	1117	1116	2491	2299	2424
Burlington, Iowa (A)	1221	1070	1150	2535	2175	2334
Burlington, Vermont (A)	1496	1290	1308	3038	2740	2859
Butte, Montana (C)	1401	1303	1261**	3641	3079	3183**
Cairo, Illinois (C)	857	768	784	1607	1447	1465
Charleston, South Carolina (C)	508	468	410	775	790	658
Charlotte, North Carolina (A)	748	713	682	1346	1378	1274
Chattanooga, Tennessee (A)	745	761	710	1511	1497	1380
Cheyenne, Wyoming (A)	1041	1001	1125	2767	2404	2840
Chicago, Illinois (C)	1141	982	1074**	2250	1942	2172**
Cincinnati, Ohio (C)	919	856	880	1779	1657	1711
Cleveland, Ohio (A)	1127	1014	1057	2284	2050	2171
Columbia, Missouri (A)	1030	906	989	2042	1769	1967
Columbia, South Carolina (A)	648	630	524	1159	1205	908
Columbus, Ohio (C)	1058	979	983	2126	1903	1995
Concord, New Hampshire (A)	1446	1192	1271	3015	2638	2839
Concordia, Kansas (C)	1157	910	1029	2271	1742	2048
Dallas, Texas (A)	550	461	518	951	802	870
Dayton, Ohio (A)	1102	1021	1032	2239	2072	2122
Deer Lodge, Montana (C)	1344	1271	1331**	3597	3127	3158**
Denver, Colorado (A)	911	934	1032	2230	2016	2348
Des Moines, Iowa (A)	1343	1094	1203	2768	2212	2455
Detroit, Michigan (A)	1165	1088	1101	2360	2214	2325
Devils Lake, North Dakota (C)	1955	1356	1668	4391	3289	3795
Dodge City, Kansas (A)	999	853	980	2017	1665	1951
Dubuque, Iowa (A)	1423	1228	1290	2967	2591	2765
Duluth, Minnesota (C)	1716	1378	1550	3880	3369	3533
Elkins, West Virginia (A)	1140	1078	995	2450	2366	2555
El Paso, Texas (A)	477	580	626	828	934	1086
Ely, Nevada (A)	1121	1208	1181	2920	2822	2864
Escanaba, Michigan (C)	1388	1195	1321	3064	2799	3056
Evansville, Indiana (A)	971	863	871	1919	1735	1715
Fargo, North Dakota	1845	1398	1615	3986	3169	3538
Fort Smith, Arkansas (A)	769	689	698	1416	1232	1273
Fort Wayne, Indiana (A)	1185	1060	1122	2444	2204	2365
Fort Worth, Texas (A)	553	464	533	964	817	890
Fresno, California (A)	455	650	580	935	1104	1011
Galveston, Texas (C)	246	192	271	398	291	402
Grand Junction, Colorado (A)	900	1195	1132	2100	2213	2293
Grand Rapids, Michigan (A)	1218	1133	1169	2590	2406	2597
Green Bay, Wisconsin (A)	1488	1288	1392	3177	2875	3035
Greensboro, North Carolina (A)	890	830	772	1670	1671	1513
Greenville, South Carolina (A)	740	728	648	1345	1404	1200
Harrisburg, Pennsylvania (A)	1124	973	964	2166	1964	1971
Hartford, Connecticut (A)	1260	1014	1082	2450	2159	2266
Hatteras, North Carolina (C)	645	566	481	981	893	788
Havre, Montana (C)	1605	1018	1383	3969	2499	3240
Helena, Montana (A)	1427	1295	1311	3644	3039	3247
Houston, Texas (C)	290	216	303	507	365	465
Huron, South Dakota (A)	1726	1321	1407	3612	2752	3003
Indianapolis, Indiana (A)	1119	1010	1051	2290	2065	2141
Jackson, Mississippi (A)	517	505	503	1037	942	882
Kansas City, Missouri (A)	1020	864	970	1960	1596	1875
Knoxville, Tennessee (A)	806	813	744	1594	1592	1454
La Crosse, Wisconsin (A)	1531	1253	1380	3116	3676	2900

(a) Data not available.
*Heating season, cumulative, from Sept. 1.
**Same normal figures as previously listed by HEATING AND VENTILATING since new figures are not available. All other normal figures in this table are based on a 30-year period covering 1921 to 1950, inclusive, recently compiled and published by the U. S. Weather Bureau.

Figures in this table, with eight exceptions, based on local weather bureau reports. Exceptions are Utica and Lewiston, figures for which are furnished through the courtesy of Coke Sales Department, Central New York Power Corp., Utica, N. Y., and Norman E. Ross, Bursar, Bates College, Lewiston, Me., respectively; Anaconda, Bozeman, Butte, Deer Lodge and Livingston, Mont., through the courtesy of the Montana Power Company. Tacoma figures through the courtesy of the Tacoma News Tribune.

[Table concluded on page 150]

DOLLINGER

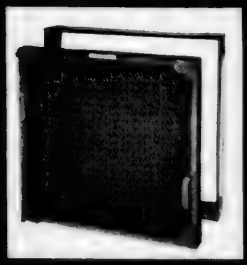
STAYNEW FILTERS FOR EVERY VENTILATING APPLICATION

STAYNEW AUTOMATIC AIR FILTERS

Designed for filtering large air volumes efficiently, these self-cleaning filters give you *positive protection* against oil entrainment in the air stream. This protection is provided by an exclusive *Staynew* feature—a second *dry* curtain providing a double filtering action. Ask for Bulletin 500.

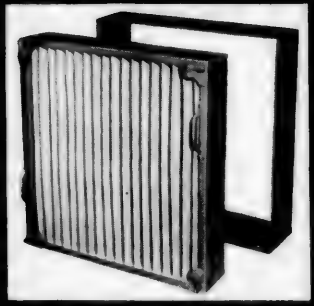
VISCOUS PANEL FILTERS

Low cost, permanent, washable type for locations where highly efficient filtration is not required. Large dust-holding capacity with amazingly low resistance to air flow. Unsurpassed for ease of cleaning. Ask for Bulletin 700.



DRY PANEL FILTERS

Highly efficient for heavy duty Ventilation work. Operates with any filtering medium that comes in sheet form and can be crimped. Preformed media can be inserted quickly and easily when required. Ask for Bulletin 600.



ELECTRO-STAYNEW PRECIPITATORS

Highly efficient—removes 90% of all air-borne dirt, including smoke, dust, pollen, oil mist. Ionizer and Collector in one unit. Available in single unit of 1200 and 1800 CFM; any capacity in multiple units. Ask for Bulletin 400.

ELECTRO-STAYNEW MIST COLLECTOR

Provides self-contained ventilating system for individual machine tools. Removes air contaminated with oil, smoke, grit, and chips and returns clean air to shop. Saves you hundreds of dollars in building maintenance expense and lost man-hours due to employee sickness. Ask for Bulletin 420.

AFI MEMBER AIR FILTER INSTITUTE

Whatever your filtering problem, wherever you are, there's a Dollinger representative ready to help you solve it with a *Staynew* filter—the *only* complete line of industrial and ventilating filters available.

Write today, and ask for catalogs describing the filters illustrated above. Dollinger Corporation, Dept. 15, Centre Park, Rochester 3, N. Y.

DOLLINGER PROTECTOMOTOR STAYNEW FILTERS

DOLLINGER CORPORATION

ALL TYPES OF FILTERS FOR EVERY INDUSTRIAL NEED

LIQUID FILTERS • PIPE LINE FILTERS • INTAKE FILTERS • HYDRAULIC FILTERS
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VISCOUS PANEL FILTERS • LOW PRESSURE FILTERS • HIGH PRESSURE FILTERS
AUTOMATIC VENTILATION FILTERS • NATURAL GAS FILTERS • SILENCER FILTERS

Degree-Days for December, 1955 (Concluded)

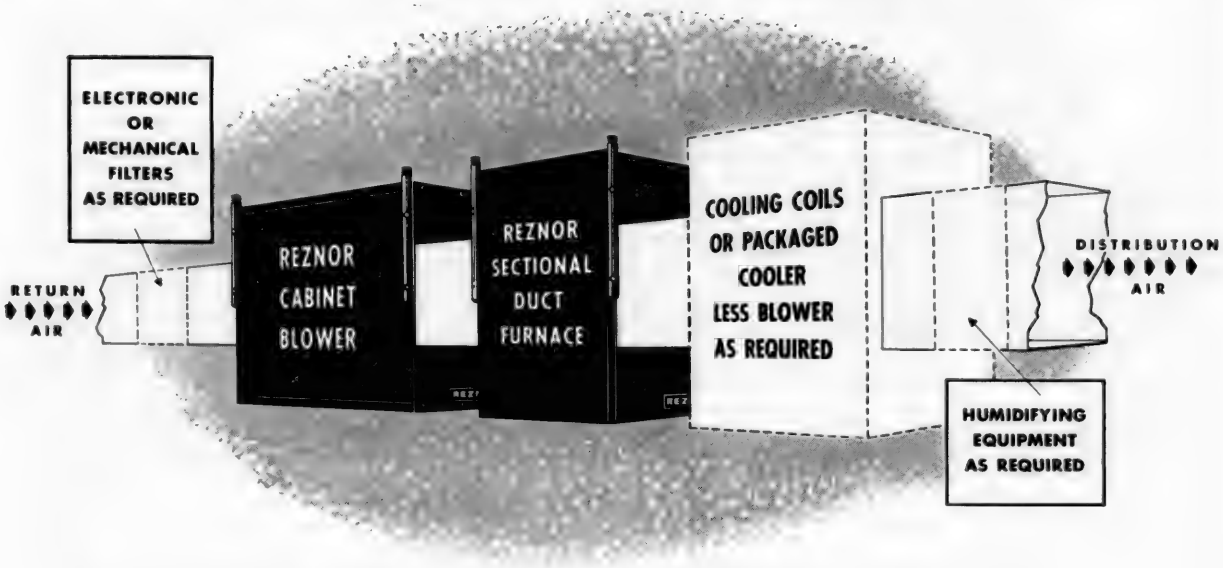
(A) Airport readings; (C) City office readings; (O) Readings at a point on outskirts of city

AIR CONDITIONING, HEATING AND VENTILATING'S 28th Year of Publication of Monthly Degree-Day Data

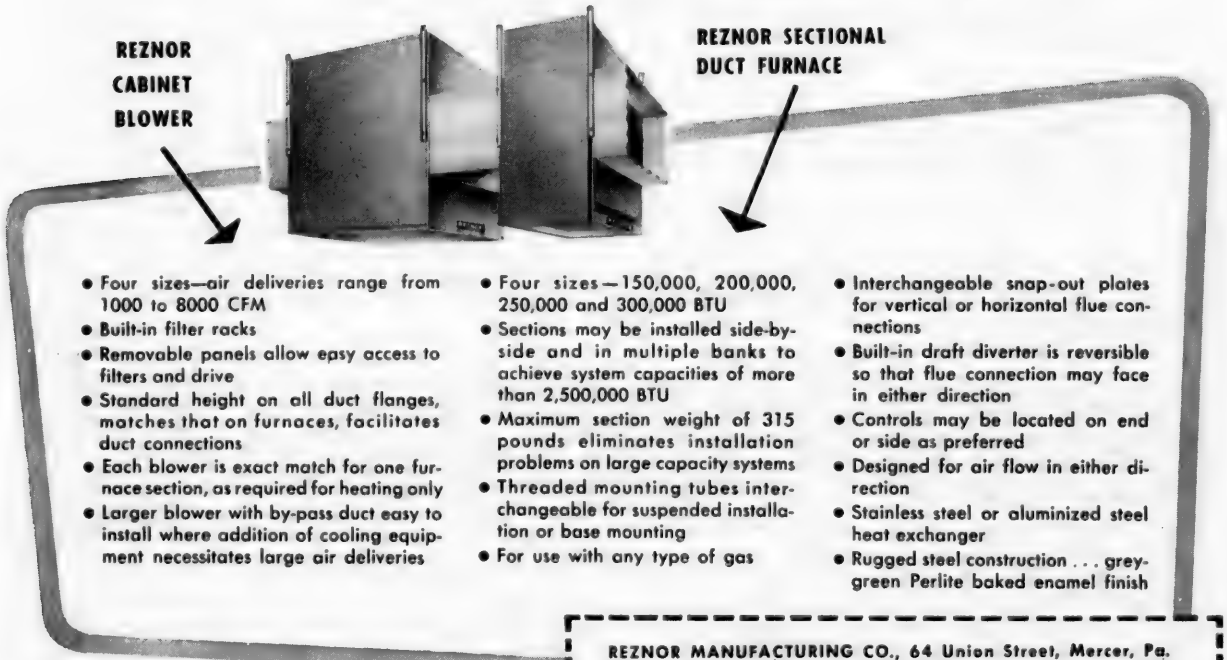
City	December			Season to December 31, incl.*		
	1955	1954	Normal	1955-56	1954-55	Normal
Lander, Wyoming (A)	1300	1214	1383	3134	2733	3309
Lewiston, Maine (O)	1398	1146	1295	2862	2660	2837
Lincoln, Nebraska (C)	1234	974	1113	2480	1947	2243
Little Rock, Arkansas (A)	693	635	654	1278	1139	1179
Livingston, Montana (C)	1196	1037	1117**	3065	2637	2731**
Los Angeles, California (C)	279	213	253	487	324	451
Louisville, Kentucky (A)	919	862	871	1806	1714	1733
Lynchburg, Virginia (A)	950	857	809	1809	1752	1625
Macon, Georgia (A)	540	532	481	1000	1006	824
Madison, Wisconsin (C)	1392	1211	1287	2879	2532	2707
Marquette, Michigan (C)	1381	1213	1299	3143	2902	3011
Memphis, Tennessee (A)	695	670	673	1340	1265	1248
Meridian, Mississippi (A)	528	564	528	1076	1049	956
Milwaukee, Wisconsin (A)	1308	1137	1218	2724	2360	2611
Minneapolis, Minnesota (A)	1631	1281	1414	3363	2764	2990
Moline, Illinois (A)	1259	1108	1181	2600	2283	2426
Montgomery, Alabama (A)	513	559	491	999	1026	864
Nantucket, Massachusetts (A)	(a)	870	924	(a)	1827	2022
Nashville, Tennessee (A)	785	768	725	1573	1496	1372
New Haven, Connecticut (A)	1177	967	1026	2255	1009	2145
New Orleans, Louisiana (C)	301	270	283	504	453	429
New York, New York (C)	1069	898	908	1908	1724	1771
Newark, New Jersey (A)	1101	916	961	1989	1804	1912
Norfolk, Virginia (A)	837	727	688	1370	1318	1257
North Platte, Nebraska (A)	1354	1065	1172	3006	2377	2563
Oak Ridge, Tennessee (C)	828	840	812	1705	1685	1587
Oakland, California (A)	428	509	508	1066	985	1077
Oklahoma City, Oklahoma (A)	849	724	747	1600	1269	1367
Omaha, Nebraska (A)	1284	1025	1166	2618	1995	2368
Parkersburg, West Virginia (C)	990	943	896	1941	1904	1824
Peoria, Illinois (A)	1194	1046	1128	2439	2115	2312
Philadelphia, Pennsylvania (C)	1010	857	856	1733	1627	1624
Phoenix, Arizona (A)	277	336	360	459	389	555
Pittsburgh, Pennsylvania (C)	1013	952	924	2011	1891	1890
Pittsfield, Mass. (A)	1431	1223	1246	3033	2711	2845
Pocatello, Idaho (A)	1026	1360	1184	2678	2848	2727
Portland, Maine (A)	1448	1160	1237	3056	2624	2776
Portland, Oregon (C)	729	691	701	1773	1470	1600
Providence, Rhode Island (A)	1219	976	1035	2372	2036	2195
Pueblo, Colorado (A)	887	905	1051	2030	1883	2279
Raleigh, North Carolina (A)	850	767	651	1546	1499	1166
Rapid City, South Dakota (A)	1331	1005	1218	3133	2342	2802
Reading, Pennsylvania (C)	1092	924	936	2018	1842	1866
Red Bluff, California (A)	519	672	564	964	1110	942
Reno, Nevada (A)	905	1007	986	2303	2394	2338
Richmond, Virginia (A)	928	826	791	1678	1612	1532
Rochester, New York (A)	1251	1152	1141	2588	2369	2473
Roswell, New Mexico (A)	692	737	750	1326	1344	1415
Sacramento, California (C)	451	644	567	868	1103	980
St. Joseph, Missouri (A)	1142	964	927	2309	1842	1809
St. Louis, Missouri (C)	945	850	893	1813	1640	1703
Salt Lake City, Utah (A)	858	1070	1039	2225	2184	2279
San Antonio, Texas (A)	359	235	374	609	403	600
San Diego, California (A)	236	207	255	445	306	478
Sandusky, Ohio (C)	1123	1002	1039	2227	2006	2116
San Francisco, California (C)	362	462	406	992	939	881
Sault Ste. Marie, Michigan (A)	1478	1351	1398	3378	3153	3340
Savannah, Georgia (A)	507	511	412	877	946	675
Scranton, Pennsylvania (A)	1277	1055	1057	2563	2194	2254
Seattle, Washington (C)	730	645	679	1975	1527	1682
Sheridan, Wyoming (A)	1345	1114	1271	3259	2564	3045
Shreveport, Louisiana (A)	493	437	490	923	803	848
Sioux City, Iowa (A)	1444	1144	1290	2959	2314	2708
Spokane, Washington (A)	1179	1072	1113	3067	2568	2705
Springfield, Illinois (A)	1121	967	1017	2272	1990	1998
Springfield, Missouri (A)	958	871	908	1906	1679	1833
Syracuse, New York (A)	1333	1152	1113	2605	2338	2340
Tacoma, Washington (C)	736	692	719	2000	1624	1850
Toledo, Ohio (A)	1289	1072	1119	2571	2221	2364
Topeka, Kansas (C)	1068	909	977	2074	1664	1891
Trenton, New Jersey (C)	1095	915	930	1987	1815	1852
Tulsa, Oklahoma (A)	816	690	750	1505	1192	1382
Utica, New York (O)	1373	1243	1144**	2720	2556	2537**
Valentine, Nebraska (A)	1458	1057	1212	3206	2394	2709
Walla Walla, Washington (C)	949	891	890	2284	1821	1966
Washington, D. C. (C)	951	841	831	1706	1634	1604
Wichita, Kansas (A)	980	854	915	1913	1547	1763
Williston, North Dakota (C)	1778	1171	1528	4072	2854	3495
Winnemucca, Nevada (A)	995	1175	1085	2636	2740	2595
Yakima, Washington (A)	1244	1033	1066	2936	2369	2469

For footnotes, see page 148.

Here's the right start for a *custom*-*engineered* heating-cooling system


ELECTRONIC OR MECHANICAL FILTERS AS REQUIRED
RETURN AIR
REZNOR CABINET BLOWER
REZNOR SECTIONAL DUCT FURNACE
COOLING COILS OR PACKAGED COOLER LESS BLOWER AS REQUIRED
DISTRIBUTION AIR
HUMIDIFYING EQUIPMENT AS REQUIRED

You complete the picture by specifying additional components to meet *exact* job requirements



- Four sizes—air deliveries range from 1000 to 8000 CFM
- Built-in filter racks
- Removable panels allow easy access to filters and drive
- Standard height on all duct flanges, matches that on furnaces, facilitates duct connections
- Each blower is exact match for one furnace section, as required for heating only
- Larger blower with by-pass duct easy to install where addition of cooling equipment necessitates large air deliveries
- Four sizes—150,000, 200,000, 250,000 and 300,000 BTU
- Sections may be installed side-by-side and in multiple banks to achieve system capacities of more than 2,500,000 BTU
- Maximum section weight of 315 pounds eliminates installation problems on large capacity systems
- Threaded mounting tubes interchangeable for suspended installation or base mounting
- For use with any type of gas
- Interchangeable snap-out plates for vertical or horizontal flue connections
- Built-in draft diverter is reversible so that flue connection may face in either direction
- Controls may be located on end or side as preferred
- Designed for air flow in either direction
- Stainless steel or aluminized steel heat exchanger
- Rugged steel construction . . . grey-green Perlite baked enamel finish

THERE IS NO "EQUIVALENT" FOR REZNOR GAS HEATERS

REZNOR
THE WORLD'S LARGEST-SELLING GAS UNIT **HEATERS**

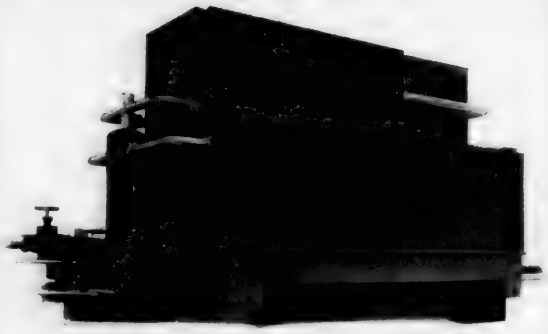
REZNOR MANUFACTURING CO., 64 Union Street, Mercer, Pa.
Please send me bulletins giving complete specification information on Reznor sectional duct furnaces and cabinet blowers

NAME_____ TITLE_____

COMPANY_____

STREET_____

CITY_____ STATE_____



NIAGARA SECTIONAL
***Aeropass* CONDENSER**

gives you lower cost refrigeration,
saves you ***LABOR,*** *Power, Water*

- **Because Niagara "Duopass" pre-cooling removes super-heat and gas condenses at lower temperature.**
- **Because the system is automatically purged of oil.**
- **Because the new design improves the heat transfer to the out-door air by evaporation.**
- **Because these features keep the condenser working for long life with "new plant" efficiency... always full capacity.**
- **Because you save 95% of cooling water cost.**

You save labor in upkeep. With full access to all parts and interior piping you see everything in easy inspections. You head off dirt accumulation and corrosion. Casing panels are removable without moving the coils. The coils can be cleaned from both sides.

First cost is low; freight is low because of the lowest space/weight ratio; you save much labor in erection. Capacity range is 90 to 240 tons. No other condensing method gives you so much saving in money and trouble.

Write for Niagara Bulletin 131.

NIAGARA BLOWER COMPANY
Dept. HV, 405 Lexington Avenue
NEW YORK 17, N. Y.
District Engineers in Principal Cities

NIAGARA *Over 40 Years' Service in Industrial Air Engineering*

IN THE FIELD

Connor Engineering Corp. has named **Richard H. Pentecost,** Kirkwood, Mo., representative for residential ceiling air diffusers for Missouri, eastern Kansas, eastern Oklahoma, northern Arkansas and southern Illinois.

Bush Manufacturing Co. and **Heat-X, Inc.,** have announced the appointment of **Herb Bolhouse** as a sales engineer. Reporting to the Chicago district office, he will work out of Grand Rapids, serving the Western Michigan area.

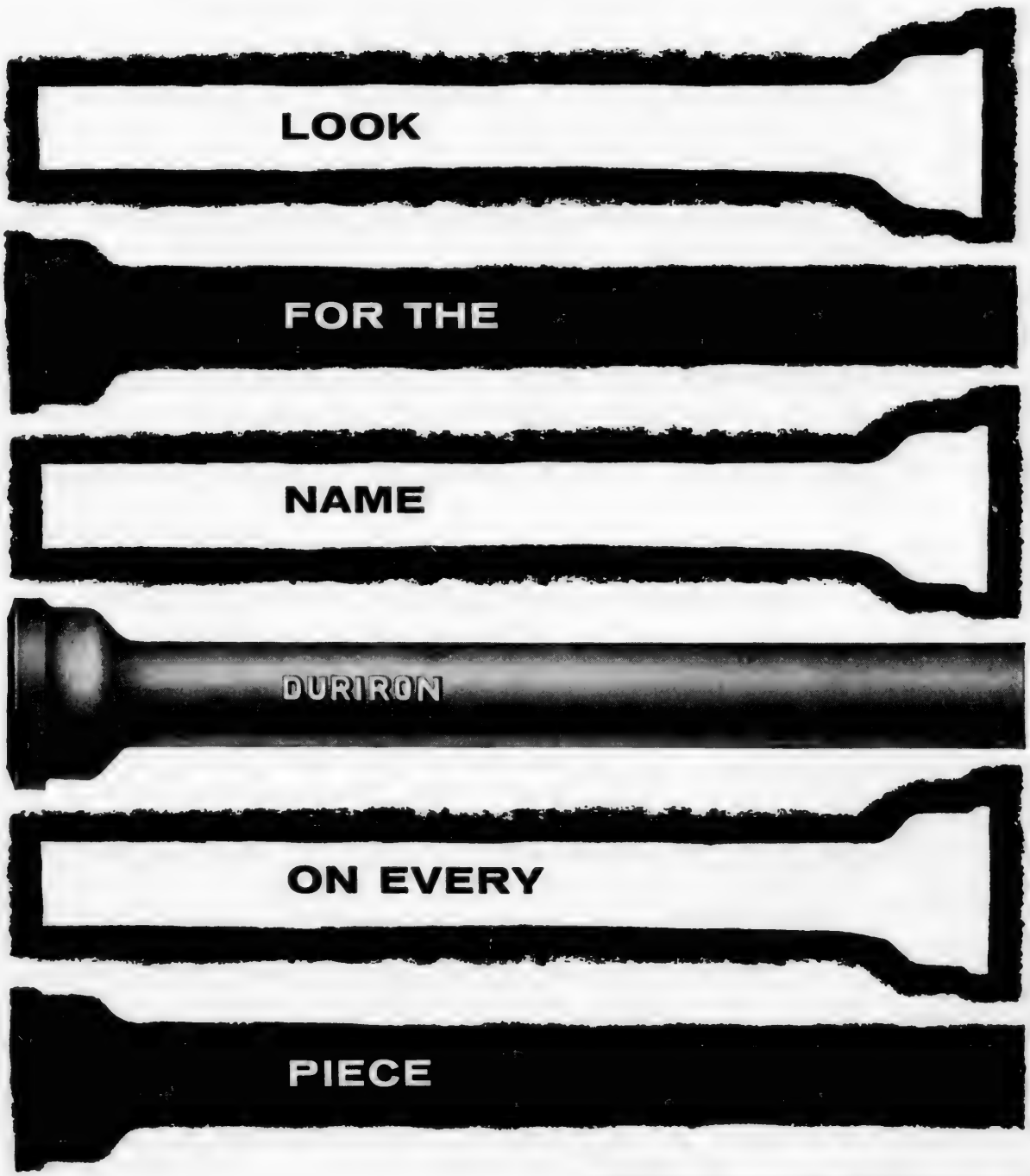
Gustin-Bacon recently announced the addition of three new men to their sales force. **J. A. Fairfield** will be assigned to the Chicago sales district. His territory will include eastern Wisconsin, northwest Illinois and northeast Iowa, formerly handled by George K. Leisenring who has resigned. **R. E. Van Winkle** will handle sales in Michigan, northern Indiana and northwestern Ohio, replacing J. E. Rapp, who has been transferred to the home office at Kansas City. **C. Barry Neill, Jr.,** will handle sales in Alabama, western Tennessee and western Georgia. He replaces Clark M. Page, now Kansas City district sales manager.

American Blower Corp. has established new district offices in **Youngstown,** Ohio; **Wichita,** Kan.; **San Antonio,** Tex.; **Evansville,** Ind.; and **Nashville,** Tenn. Named manager of the Youngstown office is **J. R. Hopkins** who moves from American Blower's Cleveland district. The Wichita office will have as manager **O. J. DuPree** who was formerly assigned to the Kansas City district. **W. F. Markey** heads up the new district office at San Antonio. He formerly served as sales engineer for the Washington, D.C., and Dallas, Texas, offices. Manager of the Evansville office will be **J. B. Clayton** who has been sales engineer in St. Louis. The Nashville office will be managed by **B. G. Kemp** who transfers from the company's Cincinnati office.

Dollinger Corporation, Rochester, N. Y., manufacturers of industrial filters, has announced the appointment of **Malcolm W. Black & Co., Inc.,** New York City, as sales representatives for New York City, Northern New Jersey, and Westchester County.

Sturtevant Division of Westinghouse Electric Corp. announces its appointment of **Industrial Supply Division, Forest Products Co.** of Kalispell, Montana as distributor for ventilating sets, industrial fans and gas-fired, steam and hot water unit heaters. Industrial Supply is headed by **C. H. O'Neil,** manager. The company will serve the states of Montana and Idaho. **Somers, Filter and Todd Co.** of Pittsburgh, Pa., has been appointed a distributor for the Sturtevant Division in the greater Pittsburgh area.

Tube Turns has appointed **L. J. Morris** assistant district manager at Pittsburgh, succeeding **W. C. Robinson.** Mr. Robinson was recently made an assistant sales manager and is engaged in sales promotional programs in the company's Eastern Division. **T. T. Thompson** has joined Tube Turns' sales staff at Pittsburgh.



DURIRON ACID PROOF DRAIN PIPE

DURIRON is the *one* quality high silicon iron pipe specified for more than 30 years by architects and engineers for corrosive waste disposal systems. Specify DURIRON. Insist on DURIRON for resistance to practically all commercial acids and other corrosive solutions. It generally outlasts the building. A complete line of DURIRON pipe and fittings is stocked by leading wholesalers throughout the country. Free Bulletin PF/4.

THE DURIRON COMPANY, INC., DAYTON, OHIO

DURIRON
LOOK FOR THE NAME ON EVERY PIECE

GET THE
Plus
IN HEATER EFFICIENCY
WITH AN OLSON

- Reverse Current Gas Travel
- Extra Heat Transfer Surface
- Completely Automatic
- Smooth, quiet operation

WRITE FOR
FREE BOOKLET

Olson Heaters are available for industrial and commercial buildings as well as a number of special adaptions. Capacities are from 300,000 to 2,000,000 BTU output.

STAINLESS STEEL combustion chamber. Floating design eliminates expansion and contraction stresses. Secondary heat transfer is provided with a multiple battery of 10 gauge boiler tubes. The extended flue gas travel and extensive heat transfer surface insures safe metal surfaces and long heater life.

Olson

STAINLESS STEEL DIRECT FIRED HEATERS

ARTHUR A. OLSON & COMPANY • Canfield, Ohio

REPRESENTATIVES IN PRINCIPAL CITIES

BOOK REVIEWS

Publications abstracted in this department should be ordered direct from publisher.

ARCHITECTURAL ENGINEERING

As part of each issue of Architectural Record, there is a section termed Architectural Engineering. From the material published in this section, the editors have selected 98 articles to present a wealth of data on topics of interest to both architects and engineers.

This book is divided into six parts as follows: building shell, environmental control, utilities, site planning, materials and special problems. Since this is a compilation of articles, it is not a textbook but should be considered as a compilation of current information on the more active areas of technical development and the ones that are likely to become active.

Architectural Engineering, edited by Robert E. Fischer. Cloth bound, 8¾ x 11⅝ in., 494 pages. Published by F. W. Dodge Corp., 119 W. 40th St., New York 18, N. Y. Price, $11.50.

AUTOMATIC CONTROL BIBLIOGRAPHY

Automatic Control Bibliography by Warren F. Wade, graduate student, Massachusetts Institute of Technology, and Emory N. Kemler, professor of mechanical engineering, University of Minnesota, lists both American and British articles on the subject. In addition to the general listing, articles are grouped by application.

These application groupings cover automation, chemical industry, control panels, control valves, courses, economics, electronic controls, engineering, food processing equipment, furnaces and kilns, heating and ventilating, history and trends, hydraulic controls, internal combustion engines, machine tools and manufacturing processes, maintenance, mechanical controls, oil and gas production applications, paper industry, pipeline applications, pneumatic controls, power plant, refinery and petrochemicals, standardization, water treatment and industrial waste disposal.

Automatic Control Bibliography, by W. F. Wade and E. N. Kemler. Cloth bound, 6½ x 8½ inches, 331 pages. Published by Summary Reports, P. O. Box 176, Spring Park, Minn. Price, $15.

• • •

ENGINEERING DATA ON OIL, GAS AND COAL-FIRED EQUIPMENT—A practical discussion of the most common problems the engineer encounters in selecting equipment for burning oil, gas, or coal in amounts up to 25,000,000 Btu per hr is presented in a booklet on Engineering Data on Oil, Gas and Coal-fired Heating and Power Equipment. It was prepared as a help for the mechanical engineer. It has material on fuel selection on oil burners, oil-burning combustion chambers, pipe sizing, piping diagrams, types of gas burners, stokers, draft, packaged units and steam generators. The 60-page publication contains worthwhile basic engineering information. Iron Fireman Manufacturing Company 3069 W. 106th St., Cleveland 11, Ohio.

ACH&V's *Ad-Digest* AND PRODUCT INFORMATION SERVICE

Below and on the following pages are given brief digests of the advertisements appearing in this month's issue. Use this Digest to locate and refer to the advertisements in which you are particularly interested, then fill out and mail the prepaid postcard to request further information from manufacturers.

The items appear in the same order as the advertisements to which they refer, to facilitate obtaining further information after reading an advertisement.

NOTE: All advertisements are digested here except those received too late for inclusion. The Index of Advertisers lists all the advertisements in this issue.

Use the postcard below for catalogs, new equipment and materials, as well as Ad-Digest items.

LINE OF TRAPS. Inside front cover. The line of steam traps for low pressure heating service made by this company features horizontal, vertical, or angle pipe connections; four commonly used trap sizes with built-in strainers; and the use of stainless materials. A steam trap book with data and prices is available. .....Item 84

CENTRIFUGAL ROOF VENTILATOR. Page 1. Running at low tip speeds, this centrifugal roof ventilator moves large volumes of air against static pressure. Low in silhouette, the ventilator is profiled to blend with modern architecture. A 16-page catalog is available containing selection data. .....Item 85

PERIMETER HEATING. Page 2. Modern steam or hot water heating with this company's perimeter heating system is compatible with air conditioning for offices, schools, hospitals, business buildings, or for any non-residential structure. The company's system adapts buildings to any commercial or industrial use. Information is available. .....Item 86

PRESSURE REGULATORS. Page 4. This company's line of pressure regulators for commercial, industrial, and institutional applications includes single seated regulators for high and reduced pressures, double seated regulators and self-contained single seated regulators. The company also offers a line of reducing valves. Catalogs on both lines are available. .....Item 87

REFRIGERANTS. Page 9. The four types of refrigeration and air conditioning refrigerants made by this company have a low moisture content and are interchangeable with comparable fluorinated hydrocarbon refrigerants produced by other manufacturers. Folders containing pressure-temperature charts are available. .....Item 88

CLASSROOM HEATING SYSTEMS. Page 11. The key to the economy of this manufacturer's system of classroom heating and ventilating is the company's hot water heating element which delivers the required amount of heat by multipassing a smaller quantity of high temperature water. The copper tubing of the system serves as the supply and return piping. .....Item 89

ELECTROSTATIC FILTER. Pages 12-13. A dry-type electrostatic filter employs an electronically charged media which is renewable. No water or sewer connections are required by the filter, and power failures cannot stop it. Product information is available in a bulletin. .....Item 90

HOT WATER BOILER. Page 16. High temperature water for heating and processing needs is provided by this company's controlled circulation, hot water boilers in sizes ranging from 10 to 200-million Btu per hr, or more with pressures to 500 psi and temperatures to 475 deg F, or higher if required. Catalog is available. .....Item 91

RENEWABLE DISC GLOBE VALVE. Page 21. A bronze globe valve with a renewable composition disc is made by this company for 150 lb steam and 300 lb oil, water, or gas in sizes from ¼ to 2 in. With interchangeable parts, the line of valves provides globe, angle, and check patterns to meet 90% of average valve needs. Information is available. .....Item 92

AIR CONDITIONING MOTORS. Pages 24-25. Squirrel-cage dripproof motors are available from this manufacturer in wide modifications to meet a variety of conditions for big air conditioning jobs. The motors are used for driving fire pumps, refrigeration compressors, and pumps in large office buildings and hotels. Detailed information is available. ..... Item 93

PACKAGED AIR CONDITIONERS. Pages 24-27. Packaged air conditioners are manufactured by this company for air conditioning supermarkets, shopping centers, and department stores. Air-cooled units, units for high velocity systems, and units for zoned air conditioning are available. .....Item 94

MOTOR CONTROLS. Page 28. The solenoid starters for air conditioning and refrigeration motors made by this company have only one moving part with no pins, pivots, or bearings to corrode and bind. The motor control's overload relays retain their accuracy, and the magnetic circuits hold through wide voltage fluctuations. A motor control catalog is available. .....Item 95

COPPER TUBE. Page 29. Depots are maintained by this copper tubing manufacturer so that wherever a customer's warehouse may be, it is within easy reach of a source of supply. The company makes tubing and only tubing in modern, integrated mills. .....Item 96

AIR CONDITIONING UNITS. Page 31. This company's line of air conditioning equipment includes air handling units, multi-zone units, remote air conditioning units, air conditioning coils, steam and water coils, and comfort conditioners. The line provides a single source of units to meet every requirement. Catalogs containing specifications of the units are available. .....Item 97

COOLING TOWERS. Pages 32-33. Special problems, such as tower location, fire codes, corrosive conditions, can be met with one of this company's line of seven cooling towers. They are available from stocks maintained in all sizable cities for air conditioning and refrigeration installations. Information is available. .....Item 98

AIR FILTERS. Page 34. A filter engineer discusses important factors in buying air filters; the advantages of sealed bids; and compares the efficiencies of dry and viscous impingement filters. His employer has more than thirty years experience in making almost every known type of filter. .....Item 99

HOT WATER STORAGE HEATERS. Page 35. The hot water storage heaters of this manufacturer met government specifications for one government building in Maryland. Converters and instantaneous heaters are also made by the company. Catalogs are available. .....Item 100

REFRIGERATION TUBING. Page 36. Copper tubing is made for air conditioning and refrigeration equipment by this fabricator with inside and outside diameters in tolerances within thousandths of an inch. Type L, copper tube, soft copper refrigeration tube, and wrought copper solder joint fittings are available from the manufacturer. .....Item 101

Circle numbers corresponding to the items and advertisements in which you are interested, print your name and address clearly. Information will be sent directly from manufacturers.

INQUIRY CARD

Circle below item numbers on which you wish catalogs or further information.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44
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84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105
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128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149
150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171
172	173	174	175	176	177	178	179														

PLEASE PRINT Feb. H-56

This service available only to U. S. and Canadian readers.

Name ..... Title .....

Firm .....

Nature of Firm's Business .....

Street .....

City ..... Zone ..... State .....

This card is void after May 1, 1956

Ad-Digest

AND PRODUCT INFORMATION SERVICE

HIGH VELOCITY DIFFUSERS. Page 39. In interior zone air conditioning, high velocity air travels to a sound attenuator volume control unit and is then carried from 2 to 4 outlets through flexible hose to this company's diffusers, which have the same outer dimensions as the acoustical panels. Air can be supplied to the sound attenuators from a dual duct system with a thermostat controlling one bay or from a single duct system with automatic or manual control. A selection manual is available. .....Item 102

INSULATED PIPING. Page 40. Insulated piping systems are prefabricated by a firm with 45 years in the insulated piping field. The systems are available for both overhead and underground use. Technical information is available in a catalog. .....Item 103

AIR-COOLED CONDENSER. Page 41. Air-cooled condensers for waterless air conditioning and refrigeration are available from this company in sizes from 2 to 20 tons. Condensers have a dimpled fin that gives 35% added heat transfer. Bulletin is available. .....Item 104

INDUSTRIAL MOTORS. Page 42. The cooling surface of this company's ribbed motors prevents insulation failures under normal conditions. The engineered partner of these TEFC motors is the company's control system. Information on particular applications of the motors is offered. .....Item 105

COOLING EQUIPMENT. Page 43. This company's line of cooling equipment includes pumps, straight tube condensers, shell and coil condensers, liquid receivers, heat exchangers, and evaporators. The units are built to ASME Code requirements. Air conditioning and refrigeration equipment literature is available. Item 106

FANS AND BLOWERS. Page 44. Doubled manufacturing and warehouse space permits this company to offer twice as many fans and blowers and to increase its number of models from 250 to more than 400. The company builds to all industry standards and also to special requirements. Bulletins with fan and blower data are available. .....Item 107

PACKAGED BOILERS. Page 45. Packaged boilers are offered by this manufacturer in 13 sizes, 110 models, with capacities from 15 to 600 hp. Where conditions dictate, oil, gas, or combination oil-gas firing can be selected. Once installation is completed, arrangements are made for training the purchaser's operator. .....Item 108

AIR CONDITIONING EQUIPMENT. Page 46. Dual conditioning systems, divided into two zones of operation (peripheral and interior) and including this company's heating, cooling, and ventilating equipment, offer flexible control for satisfying tenants' needs. Central or zone systems or packaged air conditioning are available from the company. .....Item 109

TEMPERATURE CONTROL. Page 47. A temperature regulator that controls the flow of steam, water, or gases has a powerful bellows and a minimum of valve stem friction. Its bronze union connections save installation time and labor. .....Item 110

ADJUSTABLE AIR DIFFUSERS. Page 48. These adjustable, high ceiling air diffusers provide up to a 50-ft downward throw at a 40-deg F temperature differential. Adjustable vanes permit full variation of the air patterns from vertical to horizontal. They are adjustable from the floor or through the duct from the crawl space above the ceiling. Performance data and specifications are available. .....Item 111

UNIVERSAL PUMP. Page 49. A universal pump designed for operation in liquid heating and cooling systems needs no vibration eliminators or flexible connections. Among the pump's features are: motors with lubricated bronze sleeve bearings; universal motors through 5 hp; self-aligning, spring-type coupler; a removable bearing frame; and a mechanical seal. Capacity data is available. .....Item 112

MAIN STEAM VALVES. Page 50. Two 250-lb iron body angle valves were installed in 1918 on the main steam leads from boilers of a Wisconsin plant. In 40 years of uninterrupted service, the valves never failed to operate properly nor cause a shutdown. In all grades the manufacturer's iron castings exceed requirements of equivalent ASTM specifications. Its line includes gates, globes, angles, and checks. Assistance in ordering is offered. .....Item 113

HOT PIPE INSULATION. Page 51. This company's triple-zone hot underground pipe insulation was selected to protect 1200 ft of fuel and steam lines of a new steam electric station. The insulation is made in three types for varying temperature ranges up to 850 deg F. Information is available. .....Item 114

CABINET AIR CONDITIONERS. Page 52. Cabinet air conditioners are available in 8 basic types from 1/2 to 5 tons RLCE from this manufacturer. Some heat with hot water and cool with chilled water; others are designed for steam or hot water heating systems. All units can be used with or without ducts. A 12-page bulletin with design information is available. .....Item 115

REFRIGERATING MACHINES. Page 54. A new building of a savings and loan association, including the lobby, conference and accounting areas, community room and lounge, is air conditioned with two of one manufacturer's compressors. Each refrigerating machine is driven by a motor of 40 hp. .....Item 116

CONDENSATE PUMPS. Pages 55-56. Condensate pumps, in both single and duplex units, are available from this manufacturer in capacity range from 500 to 10,000 sq ft EDR and discharge pressures from 10 to 40 lb. The company's line of heating pumps includes five different types in a variety of capacities and discharge pressures. Bulletins are available on both lines. .....Item 117

PIPE INSULATION. Page 57. Inside the midwest building of a greeting card manufacturer, 50,000 ft. of hot and cold lines are insulated with this company's one-piece, molded pipe insulation of fine glass fibers. Sections are available plain or with muslin for heated piping or with vapor barrier jackets for chilled lines. Samples and technical literature are available. .....Item 118

AIR FILTER SERVICE. Page 58. This manufacturer offers to send a field engineer who is an air filtration expert, to analyze air filters and submit a factual, written report on his findings. The company makes this service available on a no cost basis because it will point out the importance of buying standard brand filters. Information on service is available. .....Item 119

INTEGRAL-FURNACE BOILERS. Page 59. In one installation, two of this company's integral-furnace boilers supply steam for heating, cooking, and laundry requirements at a large Midwestern hospital. The steam generators are available in standard sizes for loads ranging from 2000 to 40,000 lb. of steam per hr. at pressures to 235 psi. Bulletin is available. .....Item 120

AIR CONDITIONING SERVICE. Page 60. A commercial and industrial air conditioning advisory service is offered through its best engineers by this engineering and manufacturing company. A nationwide network of trained service personnel and facilities is also offered. Information is available. .....Item 121

STEAM TRAPS. Page 61. This company's line of steam traps includes float traps, float and thermostatic traps, inverted bucket traps, and radiator thermostatic traps for low, medium, and high pressures. A dirt strainer is also made to protect the traps and valves. A catalog illustrating the line of traps is available. .....Item 122

THERMOSTATIC CONTROLS. Page 62. The thermostatic temperature regulator made by this company for automatically regulating the flow of liquid or steam through a valve is made with specially chosen metals to assure accurate temperature control with a low maintenance cost. .....Item 123

RECESSED AIR CONDITIONER. Page 63. A recessed air conditioner for commercial and institutional buildings heats with steam or hot water and cools with its own air-cooled refrigeration cycle. Heating and cooling in each room is controlled by built-in thermostats. The unit also ventilates with forced air circulation. Literature is available. .....Item 124

DRAFT CONTROLS. Page 64. Draft controls for coal and oil-fired heating plants are heavy-duty, commercial models in 20- and 32-in. sizes. They are also available in 6- to 24-in. sizes for domestic and commercial installations. Controls for gas and gas-oil fired heating plants are also made in sizes 8- through 32-in. .....Item 125

VENTILATING FANS. Page 65. Because a hospital needs quiet mechanical equipment, this company's ventilating fans were specified as a part of a hospital's ventilating and air conditioning system. The fans supply warm air in conjunction with a radiant panel heating system. Bulletin is available. .....Item 126

Postage Will be paid by Addressee

No Postage Stamp Necessary If Mailed in the U. S.

BUSINESS REPLY CARD

FIRST CLASS PERMIT NO. 36, SEC. 34.9, P. L. & R., NEW YORK, N. Y.

AIR CONDITIONING, HEATING AND VENTILATING

93 WORTH STREET

NEW YORK 13, N. Y.

AD-DIGEST SERVICE

VENTS. Page 66. This company's line of vents includes three air vents and an air eliminator. These units, of float and thermostatic construction, express an unrivaled accumulation of knowledge in dealing with air venting problems. Catalog available. ----------Item 127

BOILER SAFETY CONTROL. Page 67. A booklet on basic safety controls for hot water space heating boilers is published by this manufacturer of safety devices. Essentially, it is an engineering booklet rather than a product catalog. Local codes and Federal specifications call for the safety devices it recommends. Send for copy. ----------Item 128

STEAM BOILERS. Page 68. The steam boilers manufactured by this company were chosen to supply steam to the remote corners of an airport's buildings because they are large enough to compensate for transmission losses yet compact enough to save space. The boilers are equipped with combination gas and oil burners. ----------Item 129

ANSWERS TO PIPE PROBLEMS. Page 69. Look under this company's name in the alphabetical or classified phone books for its 28 conveniently located district sales offices maintained across the country. The offices are staffed by men who are specialists in steel, who know pipe, and who understand pipe problems. Contact the company's pipe distributor. ----------Item 130

DUCT INSULATION. Page 70. Available in compressed rolls up to 72 in. wide in standard thicknesses and lengths, this company's glass fiber duct insulation is cut with an ordinary knife, needs no special measuring, and can be wrapped around ducts and supporting hangers. ----Item 131

DUCT SILENCER. Page 71. A combination pressure reducing valve with a duct silencer is made by this manufacturer to quiet noise in high velocity systems. Installed directly in the duct work ahead of the diffusers, a single unit can handle silencing and pressure reduction for up to 3000 cfm and is adaptable to small systems and pneumatic control. Information is available. ----------Item 132

VANEAXIAL FANS. Page 71. Internal vanes of these vaneaxial fans recover the rotative energy of the air from the blades and convert that energy to velocity and pressure. One fan, which supplies air to two floors, utilizes an area 54 in. in diameter and 26½ in. long. The fans are mounted in ducts on simple supports. Bulletin is available. ----------Item 133

CAST IRON BOILERS. Page 72. Two 18-section, oil-fired boilers of this company were installed in an elementary school in 1930, were enlarged to 26 sections each in 1949, and are now serving a second generation of school children. The boilers have integral, cast iron, water tube sections which last as long as the boiler itself. ----------Item 134

REPLACEMENT STEAM TRAPS. Page 74. The replacement steam traps made by this manufacturer are not attachments, adaptors, or interior assemblies, but are complete traps with identical interior parts to those of the company's radiator traps. Made in a variety of patterns with roughing-in dimensions to fit practically all makes of traps. Descriptive literature is available. ----------Item 135

FAN EQUIPMENT. Page 75. A variety of fan equipment may be selected from this manufacturer's line of air conditioning and ventilating fan equipment. Several installations of the equipment are illustrated. ----------Item 136

COPPER DRAINAGE TUBE. Page 123. Copper drainage tube manufactured by this company is easy to handle, comes in long lengths, is easy to join, can be prefabricated in sections in the shop, requires less carpentry and space, does not clog, and is neat in appearance. Data folder is available. ----------Item 137

VACUUM HEATING PUMPS. Page 125. Available in single and duplex models with capacities from 2500 to 65,000 EDR, this company's vacuum heating pumps do not require extensive maintenance. The pumps need only one motor for removing both air and condensate and have no vacuum on the pump stuffing box. Vacuum as high as 26 in. can be provided by the pumps. Literature on the pumps is available. ..Item 138

MOTOR-COMPRESSOR. Page 127. A 10-hp motor-compressor has been introduced by this company for packaged air conditioning. The use of suction cooling and Freon-22 give the unit high capacities with low power input. Adjustments and parts replacement can be made on the spot. An engineering packet is available. ...Item 139

AUTOMATIC FIRING EQUIPMENT. Page 129. Every essential component is built into this manufacturer's forced draft firing systems, including burner, control panel, forced draft air supply, and fuel system. The firing unit can be applied to any type of boiler and fire gas, oil, or a combination. High or low pressure gas or oil from No. 2 to 6 may be used. Specifications are available. ----------Item 140

PACKLESS RADIATOR VALVES. Page 131. The dial-equipped, packless radiator valves of this company may be fully open or closed in less than one complete turn. Four body patterns are made in 5 sizes from ½ to 1¼ in. Information is available in a bulletin. ----------Item 141

SHEET METAL TOOLS. Page 131. Shears and nibblers are manufactured by this company for shearing and cutting sheet metal with speed and accuracy and without distortion for heating and cooling duct systems. ----------Item 142

SUMP PUMPS. Page 131. The sump pumps manufactured by this company have bronze impellers, adjustable steel couplings, capacitor motors, and rigid hanger pipe. An overload relay protects the motor, which has a high starting torque that prevents stalling. Bulletin is available. ----------Item 143

AIR FILTERS. Page 133. In one large candy corporation's 200 stores, air conditioning maintenance and air filtering have been improved by using this company's air filters. The filters can be changed by sales girls, they are light in weight, easy to insert in the conditioning units, and dirt particles are absorbed by the body of the filter. Bulletin is available. ----------Item 144

UNIT HEATERS. Page 135. Four-way unit heaters are made in 3 sizes for steam or hot water by this company with ratings from 55,000 to 600,000 Btu per hr. One heater will spread hot air over 8500 sq ft of floor space. ----------Item 145

INTERIOR FIRE PROTECTION. Page 135. Contractors' success stories on interior fire protection jobs indicate there is a reason why this manufacturer's line of interior fire protection equipment is preferred. Check with the company's representative before figuring on the next interior fire protection job. ----------Item 146

SIXTEEN PAGE BULLETIN. Page 137. A 16-page bulletin has just been published by this manufacturer with complete information on remote, room air conditioning units. The bulletin includes photos, drawings, typical installation, engineering and construction details, and capacity and performance characteristics. ----------Item 147

ROTARY OIL BURNER. Page 139. Rotary oil burners are manufactured for economical heavy oils by this company with a valve that will not pass the oil to the nozzle before it reaches a predetermined temperature. The burners are made in capacities from 3 to 200 gph. Literature and specification sheets are available. ----------Item 148

AIR CLEANER. Page 141. The cast iron dust produced by machining the 22,000 segments of the Lincoln Tunnel's third tube was removed by this manufacturer's self-contained air cleaner. The cleaner removes chips in a precleaner, then coarser dust particles, and finally the fine float cast iron and graphite with an oil bath scrubber. ----------Item 149

PACKAGED LIQUID CHILLERS. Page 143. Packaged liquid chillers for water or brine are made in sizes from 7½ to 200 hp. The units are factory assembled, tested, and shipped as one complete package. Bulletin containing specifications, features, and typical applications is available. ...Item 150

AIR-COOLED CONDENSER. Page 147. A remote-type, air-cooled condenser was installed by this manufacturer in the 100-ton air conditioning system of a Texas super market. The company's experience in the proper use of air as a condenser coolant is offered. Bulletin is available. ...Item 151

Use this digest to locate and refer to items and advertisements appearing in this issue, then fill out and mail the prepaid postcard to request further information.

INQUIRY CARD

Circle below item numbers on which you wish catalogs or further information.

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45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66
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128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149
150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171
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Circle numbers corresponding to the items and advertisements in which you are interested, print your name and address clearly. Information will be sent directly from manufacturers.

Ad-Digest

AND PRODUCT INFORMATION SERVICE

LINE OF FILTERS. Page 149. This line of filters for ventilating applications includes automatic air filters, viscous panel filters, dry panel filters, electric precipitators and electric mist collectors. Bulletins describing each of the filters are available. .....Item 152

SECTIONAL CONDENSER. Page 151. A sectional condenser for removing superheat and condensing gas at lower temperatures is offered by this manufacturer. The system is automatically purged of oil and it transfers the heat to the outdoor air by evaporation. The capacity range of the condenser is 90 to 240 tons. Bulletin is available. .....Item 153

IRON DRAIN PIPE. Page 152. High silicon iron pipe, made by this manufacturer, has been specified for more than 30 years by architects and engineers for corrosive waste disposal systems. Insist on the pipe for resistance to practically all commercial acids and other corrosive solutions. Bulletin is available. .....Item 154

DIRECT FIRED HEATERS. Page 154. Stainless steel, direct fired, industrial and commercial heaters are available from this company in capacities from 300,000 to 2,000,000 Btu per hr output. Secondary heat transfer is provided by a multiple battery of 10-gage boiler tubes. Booklet is available. .....Item 155

HEAT EXCHANGERS. Page 156. X-rays are taken of the welds of this company's heat exchangers to pick up flaws before they have a chance to become harmful. The X-rays are checked by an insurance company representative to see that each heat exchanger meets or exceeds the standards of the 1952 ASME Code. ...Item 156

AIR FLOW METER. Page 160. A portable, direct reading, air velocity meter is manufactured by this company for balancing air diffuser installations. An assortment of jets and fittings makes the instrument suited to all air velocity measurements. Balancing instructions and a bulletin are available. .....Item 157

AIR CONDITIONING SYSTEMS. Page 161. Heat loads, glass areas, number of occupants, floor areas, and other factors that influence the choice of an air conditioning system for a large building are taken into consideration by this company before designing a system for a particular building. One of the company's systems was installed in New York's Colgate-Palmolive Building. .....Item 158

FLEXIBLE DUCT CONNECTORS. Page 162. These one-piece, factory-assembled, metal-to-material duct connectors unroll flat. Any type of flexible duct connectors can be fabricated by just measuring and cutting. Available in 25, 50, or 100-ft rolls in 3- or 4-in. widths. Catalog and specification sheet are available. .....Item 159

CONDUIT SYSTEMS. Page 163. Any combination of service piping can be accommodated by this company's conduit systems using either filler or sectional insulation. Round systems are available in 12 sizes, and tunnel systems are available in 10 sizes with side blocks in 3 sizes. Bulletin with details is available. .....Item 160

AUTOMATIC BOILER. Page 164. Accessibility is built into this automatic boiler. Used for high or low pressure steam and for hot water applications, the packaged steam generator has a range from 20 to 500 hp and can be gas, oil or combination fired. Bulletins are available. .....Item 161

EXHAUST HOSE. Page 165. The flexible hose made by this company can be used for fume exhaust, for dust or chip collection, for ventilation, or for handling bulky material. Bulletins giving data on flow characteristics, installation procedure, sizes, fittings and accessories are available. .....Item 162

AIR DIFFUSER MANUAL. Page 165. A manual on high pressure air diffusers is offered by this manufacturer. The illustrated manual details the facts about high pressure systems and includes data on sound levels, temperature differential, air distribution, and air duct design by static regain. .....Item 163

VIBRATION CONTROL. Page 166. This manufacturer's vibration controls permit vibration-free, upper floor air conditioning installation. Recommendations on media, whether it be springs, rubber, or cork, alone or in combination, are offered by the company. Booklet is available. .....Item 164

HEAT EXCHANGERS. Page 167. One of the thousands of custom-made heat exchangers that this manufacturer builds for industrial needs is a 13,000-cfm direct fired air preheater. The stainless steel combustion chamber sets below the tube banks, and air exit temperature is 1000 deg F. .....Item 165

LINE OF AIR DIFFUSERS. Page 167. Air diffusers for every application in this manufacturer's line include: cooling, cooling and heating, supply and return, half-round, rectangular, and square. The diffusers are adjustable, for air volume and diffusion pattern. Air diffuser catalog is available. .....Item 166

AIR HANDLING EQUIPMENT. Page 168. The line of air handling equipment offered by this manufacturer includes unit heaters, industrial heaters, fans, steam heating coils, ventilating sets, and packaged units for heating, ventilating, and air conditioning. An application service for the equipment is offered. .....Item 167

SPRAY NOZZLES. Page 169. A wide choice of spray nozzle types and capacities are supplied by this manufacturer. Line strainers are also available in all standard capacities. A 48-page catalog with nozzle specifications is available. .....Item 168

CABINET UNIT HEATERS. Page 169. Thorough engineering research preceded the manufacture of these cabinet unit heaters. Alternative features and designs were analyzed from the standpoint of proved practicality and efficiency. Complete information on the cabinet unit heaters is available. .....Item 169

REFRIGERANT INDICATORS. Page 169. Advance design of these refrigerant indicators, which use a sight glass, keeps refrigerant losses to a minimum. Engineers dealing with fluid flow problems associate the name of these indicators with engineering assistance. A company representative will help in the choice of an indicator. Send for catalog. .....Item 170

AIR DUCT HEATERS. Page 171. Controlled temperatures to 1000 deg F can be maintained by electric air duct heaters for heating air and gases under forced circulation. Installed in round or rectangular ducts, the heaters may be used for drying, curing, baking, and annealing ovens. Catalog is available. .....Item 171

DIRECT DRIVE VENTILATORS. Page 171. Spun aluminum, direct drive ventilators, with rubber mounting, are available from this manufacturer in speeds as low as 490 rpm. Two ventilators are available with capacities from 300 to 9200 and 300 to 2100 cfm. Wall ventilators and belt drive centrifugal ventilators are also available. Catalog is offered. .....Item 172

HIGH VELOCITY AIR FILTERS. Page 171. This filter media has special hemmed edges for strength and safe, easy handling. They have a maximum efficiency of 288 to 510 fpm. Low velocity and grease filters are also made. Catalogs available. Item 173

COMBUSTION TEST KIT. Page 173. A combustion test kit is offered by this manufacturer for testing residential, commercial, or industrial installations whether gas, oil, or coal fired. An analysis can be performed in less than 30 seconds to within plus or minus ½% carbon dioxide. The kit includes a draft gage with a choice of three ranges. Information is available. ...Item 174

OIL UNIT HEATER. Page 173. One of this manufacturer's oil-fired unit heaters, installed at an open warehouse platform, enables loaders to work more than short shifts in cold weather. This is only one of hundreds of jobs that the oil unit heaters can do better and economically. A catalog is available. .....Item 175

AIR DIFFUSERS. Page 173. Air diffusers with diffusing vanes provide air patterns unlimited without blank-off. The diffusers are made with square and rectangular outlet design. The company's engineering staff and laboratory resources are available. .....Item 176

MULTI-FUNCTION CEILING. Page 174. A ceiling that provides radiant heating, cooling, ventilation, humidity control, noise reduction, and lighting from one integrated unit is offered by this manufacturer. A booklet containing photographs, details, and design data is offered by the company. .....Item 177

AIR HANDLING EQUIPMENT. Inside back cover. Every minute, 2,251,623 cu ft of air is handled by this company's equipment in New York's new Coliseum. Seventy-five fans, 24 sprayed coil units, and 14 conditioning units were selected for the job. The company has perfected equipment for every type of application. .....Item 178

TEMPERATURE CONTROL. Back cover. The air conditioning system of an aluminum company's new sales center is equipped with this manufacturer's individual room thermostats. The thermostats control the hot and cold duct dampers in high velocity mixing boxes serving each room. The company's apparatus is combined into a single control system. Engineering recommendations are offered. .....Item 179

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City	November		December	
	1955	Normal	1955	Normal
Calgary, Alta.	1718	1122	1815	1426
Charlottetown, P. E. I.	875	858	1429	1246
Crescent Valley, B. C.	1183	981	1309	1240
Edmonton, Alta.	1790	1215	1973	1578
Fort William, Ont.	1189	1143	1737	1596
Grande Prairie, Alta.	1934	1218	2129	1649
Halifax, N. S.	766	789	1255	1138
London, Ont.	897	843	1285	1200
Medicine Hat, Alta.	1629	1104	1748	1417
Moncton, N. B.	940	936	1505	1373
Montreal, P. Q.	900	948	1564	1407
North Bay, Ont.	1110	1017	1694	1528
Ottawa, Ont.	969	984	1607	1494
Penticton, B. C.	1096	813	1187	1073
Prince George, B. C.	1692	1068	1913	1504
Quebec City, P. Q.	993	1050	1660	1534
Regina, Sask.	1709	1355	2023	1779
St. John, N. B.	876	870	1479	1271
Saskatoon, Sask.	1750	1305	2071	1767
Timmons, Ont.	1201	1230	1850	1724
Toronto, Ont.	809	817	1223	1155
Vancouver, B. C.	832	657	896	818
Victoria, B. C.	801	462	847	738
Windsor, Ont.	844	795	1177	1172
Winnipeg, Man.	1485	1302	2018	1829

*These data are supplied through the courtesy of the Meteorological Division Air Service Branch, Department of Transport, Canada.

COMING EVENTS

Where listed, names or titles of individuals are those from whom further information is available.

CHEMICAL ENGINEERS MEETING—Thirty-third national meeting of the American Institute of Chemical Engineers, at the Statler Hotel, Los Angeles, Calif. Secretary of the Institute, 25 W. 45th St., New York 36, N. Y. **FEBRUARY 26-29, 1956.**

TESTING MATERIALS MEETING—National meeting of the American Society for Testing Materials, at the Hotel Statler, Buffalo, N. Y. Fred F. Van Atta, assistant secretary of the Society, 1916 Race St., Philadelphia 3, Pa. **FEBRUARY 27-MARCH 2, 1956.**

CORROSION SHOW—1956 Corrosion show, held in conjunction with the 12th annual conference of the National Association of Corrosion Engineers, at the Hotel Statler, New York, N. Y. A. B. Campbell, executive secretary of the Association, 1061 M & M Building, Houston 2, Tex. **MARCH 12-16, 1956.**

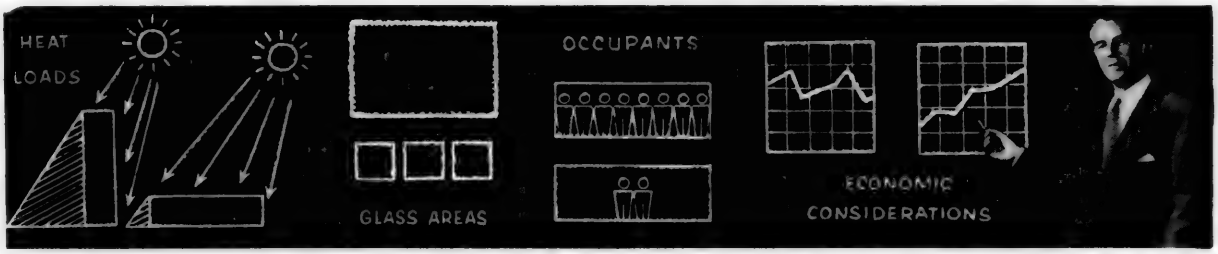
INDUSTRIAL ENGINEERS CONFERENCE—Fifth annual spring conference of the American Institute of Industrial Engineers (Cleveland Chapter), to be held in Cleveland. W. S. Ritchie, Room 330, Cuyahoga Savings Building, 2123 E. 9th St., Cleveland 15, Ohio. **MARCH 15-16, 1956.**

ASME MEETING—Spring meeting of the American Society of Mechanical Engineers, at the Multnomah Hotel, Portland, Ore. C. E. Davies, secretary of the Society, 29 W. 39th St., New York, N. Y. **MARCH 18-21, 1956.**

POWER CONFERENCE—18th annual American Power Conference, at the Hotel Sherman, Chicago, Ill., sponsored by Illinois Institute of Technology, 25 W. 23rd St., Chicago, Ill. **MARCH 21-23, 1956.**

FORCED WARM AIR CONFERENCE—25th annual Forced Warm Air Conference, sponsored jointly by Michigan State University and the National Warm Air Heating and Air Conditioning Association, to be held at Kellogg Center, Michigan State University, East Lansing, Mich. George Boeddener, managing director of the Association, 145 Public Square, Cleveland 14, Ohio. **APRIL 2-5, 1956.**

(Concluded on page 162)



Heat loads and glass areas and number of occupants and floor areas, economic considerations and taxes and depreciation and operating costs—all these factors (and still others) influence the choice of an air conditioning system for a large building. And since these factors vary from building to building, obviously no one system—or even two or three—can answer each building's needs best. That's why York carefully selects and then precision-engineers each Yorkaire System to fit its particular building.

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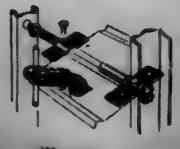

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COMING EVENTS

(*Concluded from page 160*)

LUBRICATION ENGINEERS MEETING—Annual meeting of the American Society of Lubrication Engineers, at the William Penn Hotel, Pittsburgh, Pa. Secretary of the Society, 343 So. Dearborn St., Chicago, Ill. . . . . **APRIL 4-6, 1956.**

ENVIRONMENTAL TESTING MEETING—Second annual meeting of the Science Section of the Environmental Equipment Institute, at the Sheraton Hotel, Chicago, Ill. H. F. Sander, meeting chairman, Vapor Heating Corp., 6420 W. Howard St., Chicago, Ill. . . . . **APRIL 16-20, 1956.**

GAMA MEETING—Annual meeting of the Gas Appliance Manufacturers Association, at The Greenbrier, White Sulphur Springs, West Virginia. H. Leigh Whitelaw, managing director of the Association, 60 E. 42nd St., New York, N. Y. . . . . **APRIL 19-21, 1956.**

LIQUEFIED PETROLEUM GAS SHOW—Convention and trade show of the Liquefied Petroleum Gas Association, at the Conrad Hilton Hotel, Chicago, Ill. R. E. Borden, director of publicity of the Association, 11 S. LaSalle St., Chicago 3, Ill. . . . . **MAY 6-9, 1956.**

AIR CONDITIONING AND REFRIGERATION MEETING—Annual meeting of the Air Conditioning and Refrigeration Institute, at The Homestead, Hot Springs, Va. Secretary of the Institute, 1346 Connecticut Ave., N. W., Washington 6, D. C. . . . . **MAY 7-9, 1956.**

MECHANICAL CONTRACTORS MEETING—Annual meeting of The Mechanical Contractors Association of America (formerly, Heating, Piping and Air Conditioning Contractors National Association), at The Brown Hotel, Louisville, Ky. Secretary of the Association, 1250 Avenue of the Americas, New York 20, N. Y. . . . . **MAY 15-18, 1956.**

ASRE MEETING—52nd annual meeting of the American Society of Refrigerating Engineers, at the Sheraton-Gibson Hotel, Cincinnati, Ohio. R. C. Cross, secretary of the Society, 234 5th Ave., New York 1, N. Y. . . . . **JUNE 3-6, 1956.**

NDHA MEETING—47th annual meeting of the National District Heating Association, at the Inn and Lodge, Williamsburg, Va. J. F. Collins, Jr., secretary-treasurer of the Association, 827 N. Euclid Ave., Pittsburgh, Pa. . . . . **JUNE 4-7, 1956.**

PLUMBING AND HEATING EXPOSITION—1956 National Plumbing and Heating Exposition, in conjunction with the 74th meeting of the National Association of Plumbing Contractors, Inc., to be held in the Milwaukee Auditorium, Milwaukee, Wis. Secretary of the Association, 1016 20th, N. W., Washington, D. C. . . . . **JUNE 11-14, 1956.**

OIL-HEAT SHOW—21st National Oil-Heat and Air Conditioning Exposition, at the new Coliseum, New York, N. Y., to be held concurrently with the 34th Annual OHI Convention of the Oil-Heat Institute of America, with headquarters at the Park Sheraton Hotel, New York. R. H. L. Becker, managing director of the Institute, 500 Fifth Ave., New York 36, N. Y. . . . . **JUNE 11-16, 1956.**

ASME MEETING—Semi-annual meeting of The American Society of Mechanical Engineers, at the Hotel Statler, Cleveland, Ohio. Secretary of the Society, 29 W. 39th St., New York, N. Y. . . . . **JUNE 17-21, 1956.**

TESTING MATERIALS MEETING—59th annual meeting of the American Society for Testing Materials, at the Chalfonte-Haddon Hall, Atlantic City, N. J. Secretary of the Society, 1916 Race St., Philadelphia 3, Pa. . . . . **JUNE 17-22, 1956.**

ASHAE MEETING—Semi-annual meeting of the American Society of Heating and Air-Conditioning Engineers, Inc., at the Shoreham Hotel, Washington, D. C. A. V. Hutchinson, secretary of the Society, 62 Worth St., New York 13, N. Y. . . . . **JUNE 18-20, 1956.**

INSTRUMENT SOCIETY EXHIBIT—11th annual Instrument-Automation Conference and Exhibit (International), of the Instrument Society of America, at the new Coliseum building, New York, N. Y. J. McCaffery, assistant executive secretary of the Society, 1319 Allegheny Ave., Pittsburgh 13, Pa. . . . . **SEPTEMBER 17-21, 1956.**

HEATING AND AIR CONDITIONING EXPOSITION—1957 International Heating & Air-Conditioning Exposition, under the auspices of the American Society of Heating and Air-Conditioning Engineers, Inc., to be held at International Amphitheater, Chicago, Ill. E. K. Stevens, manager, International Exposition Co., 480 Lexington Ave., New York 17, N. Y. . . . . **FEBRUARY 25-MARCH 1, 1957.**

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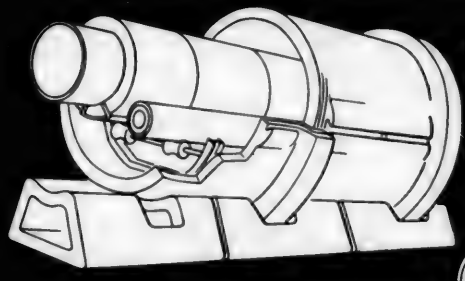
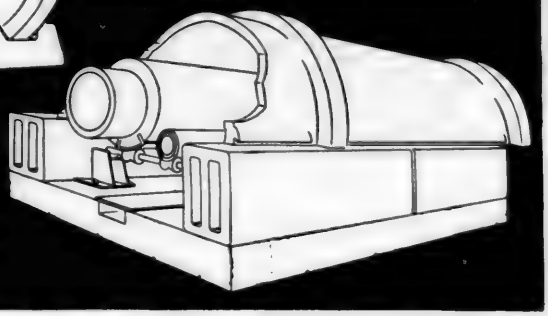


ROUND SYSTEM . . . supplied complete with combination underdrain and support structure. Available in 12 sizes, each with the proper underdrain support.



TUNNEL SYSTEM . . . installed on a simple concrete pad. With Tunnel Arch in ten sizes and Side Blocks in three sizes, any combination of piping can be used.

STILLWATER CONDUIT SYSTEMS

There's one material that never wears out underground. That's vitrified clay. And vitrified clay is the major component of Stillwater Conduit Systems—both Tunnel and Round types. When you run your service piping underground, through Stillwater Conduit, you not only eliminate unsightly jungles of overhead pipe . . . you protect that piping permanently . . . and you lay it straight and true, with fewer "runarounds" to avoid obstacles, and fewer fittings that cause turbulence and pressure drop.

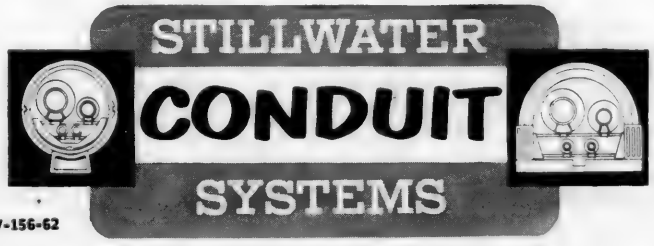
Stillwater Conduit Systems are completely unaffected by extremes of temperature or moisture, or the attack of corrosive soils and ground waters. They provide the *best possible* protection for the enclosed metal service piping. We'll give you all the engineering help you need to design the complete system—and we'll follow through by supervising the actual construction job. Large warehouse stocks assure prompt shipment of any size order, complete with all accessories.

Any combination of service piping can be accommodated by Stillwater Conduit Systems, using either filler or sectional insulation.

WRITE FOR *new four-page, file-size bulletin, with full details*

STILLWATER CONDUIT DIVISION

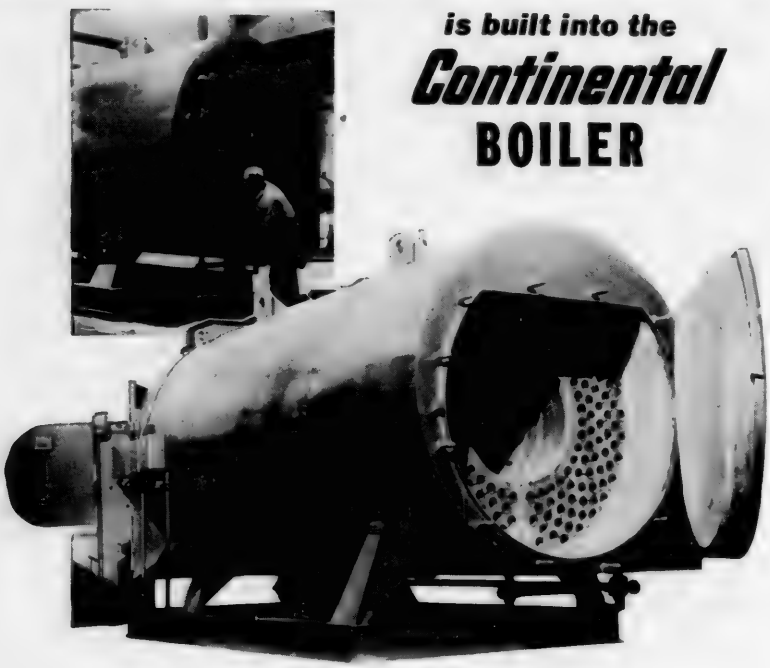
3334E PROSPECT AVENUE, CLEVELAND 15, OHIO



SW-156-62

ACCESSIBILITY

is built into the
Continental
BOILER



. . . saves production time
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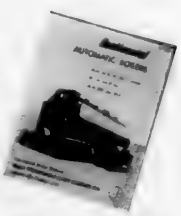
Rugged, simple in design, accessible—that's the Continental Automatic Boiler. Here are a few reasons why it's easy to keep this packaged steam generator at peak efficiency:

- Openings are provided to facilitate inspection of steam and water space.
- Both front and rear doors are hinged—affording quick access to furnace and return tubes.
- Cleaning, when necessary, is easy. One man can open both doors in a matter of minutes.

AND HERE'S WHY CONTINENTAL BOILERS STAY EFFICIENT FOR A LONG TIME:

- 2-pass design eliminates refractory baffles in front and rear which may burn out, leak and cause short circuit of gases.
- *All* return tubes are subjected to the same temperature and do equal work . . . and there is more uniform longitudinal expansion of the pressure vessel.

Used for high or low pressure steam and for hot water applications, Continental Boilers are fully automatic, range from 20 to 500 hp. and can be gas, oil or combination fired. Over 80% efficiency is guaranteed.



Send for Bulletins BE3-4 . . . and let us bid on the next boiler you need.

Continental AUTOMATIC BOILERS

BOILER ENGINEERING
and Supply Company, Inc.

7 Manavon Street
Phoenixville, Pa. Phone 5832

NEW CATALOGS

Use the prepaid postcard on page 155 for securing your copies of catalogs described in this department.

HEAT EXCHANGER TUBING—An 8-page technical folder on heat exchanger and condenser tubes is issued by Tubular Products Div., The Babcock & Wilcox Co., Beaver Falls, Pa. Identified as TB-329B, the bulletin covers pertinent information on all of the various popular grades of carbon, alloy and stainless steel heat exchanger tubing, both seamless and welded. It also includes a special section dealing with the problems of installing heat exchanger and condenser tubes by the expanding method. ---------- **Item 63**

V-BELT DATA SHEET—A data sheet on its line of Multi-V belts has been published by B. F. Goodrich, Industrial Products Div., Akron, Ohio. Included in the data sheet is a chart showing standard and high capacity V-belt numbers, sizes, and pitch lengths. An interchange list for the belts is also featured. ---------- **Item 64**

DIFFUSER BULLETIN—Bulletins describing circular, square, and rectangular ceiling diffusers are published by Carnes Corp., Verona, Wis. A third bulletin describing power roof ventilators is also published by the company. ---------- **Item 65**

COOLING CONTROLS CATALOG — A catalog describing a line of air conditioning and refrigeration controls is published by General Controls Co., Glendale, Calif. Many new controls, plus late improvements and changes in the line, are cataloged for the first time. ---------- **Item 66**

SEWER PIPE BOOKLET—An 8-page booklet on Transite sewer pipe with Ring-Tite couplings is issued by Johns-Manville, New York, N. Y. It illustrates and explains economies which asbestos-cement pipe can effect in the design, installation, operation and maintenance of a sewer system. The booklet concludes with a table of sizes, weights, and crushing strengths on the back cover. ---------- **Item 67**

THERMOSTAT BROCHURE—A brochure describing and illustrating a pneumatic round thermostat is available from Minneapolis-Honeywell Regulator Co., Minneapolis, Minn. The brochure has a detachable card for obtaining technical data on the thermostat. ---------- **Item 68**

VALVE CATALOG—Catalog NVC-2 covering a line of bronze valves is offered by Northern Indiana Brass Co., Elkhart, Ind. The 28-page publication lists more than 250 different sizes and styles of low pressure, pressure rated, and flared tube valves, including solder and threaded end swing check valves. ---------- **Item 69**

COOLING TIMER BULLETIN — Bulletin No. 511 on air conditioning time controls has been prepared by Tork Clock Co., Inc., Mt. Vernon, N. Y. Divided into two sections, the bulletin deals with commercial installations (installed time switches) and window models (portable plug-in time switches). ---------- **Item 70**

(*Continued on page* 166)

EXHAUST...

WHEN You Want It
WHERE You Want It

FOR EVERY INDUSTRIAL APPLICATION

with FLEXAUST® hose

In a large midwestern chemical plant, 12" I.D. Flexaust Hose is used to exhaust fumes and heat from a flame-cutting operation. The hood to which the Flexaust hose is attached is carried on a movable boom, putting the exhaust exactly where it is needed. Available in 1¼" to 36" I.D.

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• Unskilled labor can cut and install Flexaust duct quickly and easily. A set-up like this one can be easily installed and just as easily moved to meet changes of process or relocation of machines. It can be cut to any length, and is easily coupled to any other duct work.

HIGHLY FLEXIBLE

• No layout problems with Flexaust! Made of nylon or cotton base impregnated with age-resistant Neoprene compound and reinforced with spiral wire, it will not kink or flatten. It maintains its cross-section even on sharp bends. As it has excellent lengthwise compressability, it is easy to transport and store.

LONG LASTING

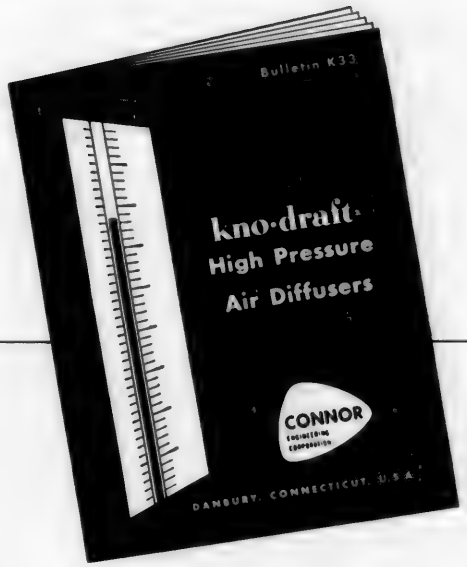
• Flexaust is highly resistant to corrosion, moisture, chemical deterioration and flexing fatigue. Its bonded, double ply, double overlap construction makes it fully air-tight for pressure, suction or gravity operations. It outlasts other types of ducts in handling abrasive dusts as in grinding, materials handling, etc.

You can use Flexaust for fume exhaust, for dust or chip collection, for ventilation, for handling of bulky materials. In every application it proves its economy in first cost and simplicity of installation . . . its efficiency in its performance and adaptability to all types of jobs. Also available, retractable type Portovent duct.

Write today for bulletins giving complete data on flow characteristics, installation procedure, sizes, fittings and accessories.

THE FLEXAUST COMPANY

Dept. HV-2, 100 Park Avenue, New York 17, N. Y.
Formerly American Ventilating Hose Co.
Stocks are available from coast to coast



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High pressure air transmission is being used more and more for air conditioning systems because: (1) it is easily adjustable to building interior changes; (2) it permits individual room temperature controls to be incorporated into central station systems; and (3) its small air ducts save space.

The manual illustrated, written out of years of experience by Connor engineers, details the facts about high pressure systems in general and the various Kno-Draft High Pressure Air Diffusers in particular. Engineers will find much information helpful in designing high pressure systems. Data on sound levels, temperature differentials, air distribution and air duct design by static regain are included. Much of this material is here published for the first time.

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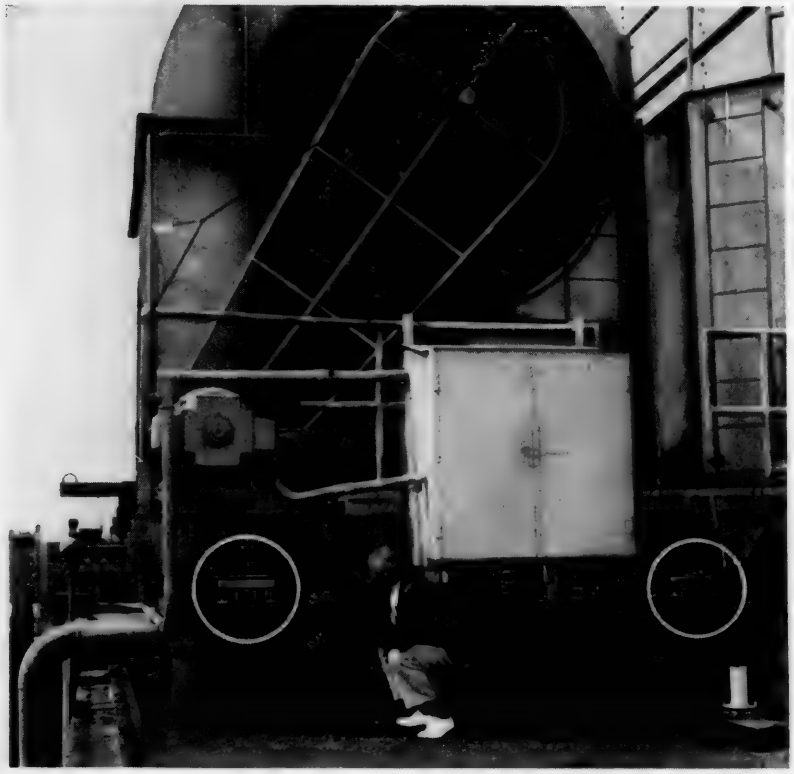
VIBRATION CONTROL



Means MORE ROOMS FOR RENT

The ability to utilize every inch of available space is sometimes the difference between profit and loss in building management.

The photo shows a fan installation on the roof of a famous hotel. Until the Korfund Steel-Spring Vibro-Isolators were installed, twenty rooms on the floor below could not be rented because of vibration. Even water standing in drinking glasses showed a decided side-to-side movement. The simple rubber pads installed previously just couldn't do the job.

Correcting faulty vibration control installations such as this, and recommending the right way the first time is made possible by experience. Korfund has more than a half-century of experience in the vibration control field. So when you have a problem, bring it to Korfund—you'll get impartial recommendations on media, whether it be springs, rubber, or cork, alone or in combination. Our experience will tell us which is best for you. And after all, there is no substitute for experience. Korfund can help you solve your vibration problem.

Write for a copy of the booklet "Air-Conditioning Goes Up in the World" which tells how to increase profits through vibration-free upper floor installations. Ask for Bulletin 32.

For specific recommendations, contact us or one of the 46 local Korfund offices. Look under "Korfund" in your local Telephone Directory or in Thomas' Register.

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In Canada: 510 Canal Bank, Ville St. Pierre, Montreal

NEW CATALOGS

(Continued from page 164)

Use the prepaid postcard on page 155 for securing your copies of catalogs described in this department.

DEHUMIDIFIER BULLETIN—A 20-page, illustrated catalog (Bulletin 7827), describing central station type sprayed coil dehumidifiers, is available from American Blower Corp., Detroit, Mich. The catalog features a special 10-page section of application data and outlines the design and construction features of the sprayed coil units. ..... **Item 71**

PRODUCTS AND SERVICES—Automatic control and instrumentation components; water conditioning and steam testing equipment, chemical feeding devices; and chemicals for food processing, paper processing and for metal protection are some of the subjects discussed in a 28-page bulletin (GSP-901) published by Hagan Corp., Pittsburgh, Pa. The bulletin summarizes the products and services of the company and its subsidiaries. ..... **Item 72**

HEAT MACHINE BULLETIN—A bulletin (LL-2220) describing heat machine models PW-189 and VO-168 is announced by R. D. Fageol Co. Kent, Ohio. Specifications and application data on both machines is presented in detail. ..... **Item 73**

AIR CONDITIONING SCHOOLS—A low-cost method of air conditioning schoolrooms is described in a booklet published by Herman Nelson Unit Ventilator Products, American Air Filter Co., Inc., Louisville, Ky. The method described is intended for cooling, heating, and ventilating schools in mild climates where winter heating requirements are not great but cooling problems are critical. ..... **Item 74**

PLUMBING FIXTURE GUIDE—An architects and builders portfolio, designed to serve as reference guide to plumbing fixtures for commercial, industrial, institutional, and residential use, has been prepared by Richmond Radiator Co., Metuchen, N. J. Several informative aids are included: a 32-page catalog on vitreous china and cast iron plumbing fixtures; matched samples of fixture colors; sheets showing typical installations; and an idea sheet for decorating. ..... **Item 75**

STEAM TRAP SELECTOR — A 12-page bulletin (Yarway T-9) designed to aid in the selection and application of steam traps on chemical processing equipment is available from Yarnall-Waring Co., Philadelphia, Pa. The bulletin features a three-page, fold-out, piping diagram for twenty-two pieces of typical processing equipment—each showing recommended steam trap and piping arrangements. ..... **Item 76**

HEAT EXCHANGER GUIDE—A 32-page, technical catalog for users of shell and tube type heat exchangers is published by E. C. Cooley Co., San Francisco, Calif. A guide to efficient equipment selection, the catalog contains a prepared system of curves and examples rather than tabulated performance data ..... **Item 77**

(Concluded on page 168)

JUST TO SHOW YOU

one of the thousands of custom-made

heat exchangers

that Paracoil builds

for industrial needs

A 13,000 cfm direct-fired air preheater being assembled at our Elizabeth plant. The stainless steel combustion chamber (not shown) sets below the tube banks. Air exit temperature 1000° F.

OUR EXPERIENCED ENGINEERS are available to expedite planning and specification work and to suggest the most suitable and economical exchanger design.

MODERN MANUFACTURING facilities and advanced techniques, skilled and seasoned shop personnel guarantee fabrication to rigid specifications.

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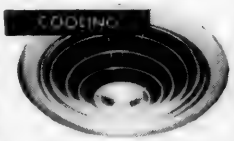
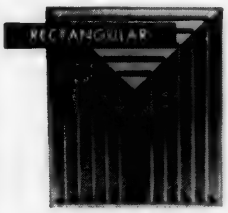
Let our sales engineers show you why Flexiflo is better for your jobs. But first — get the Flexiflo catalog.



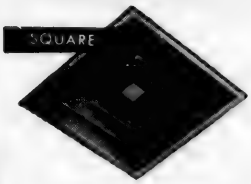
Type R, constant flow pattern regardless of volume adjustment.

Type V, fully adjustable air diffusion pattern and volume.



Type MP, for 1-, 2-, 3- or 4-way diffusion to accommodate any shaped area, 16 styles.

Type CH, adjustable for heating, ventilating and cooling.



Type H, adjustable volume, constant pattern and radius of diffusion.

Type S, side wall or ceiling, with Type R or V blades for heating or cooling.

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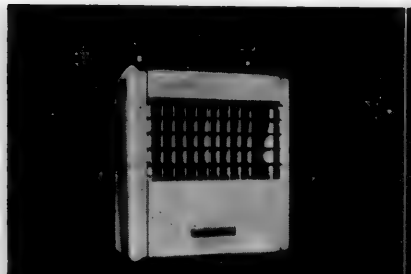
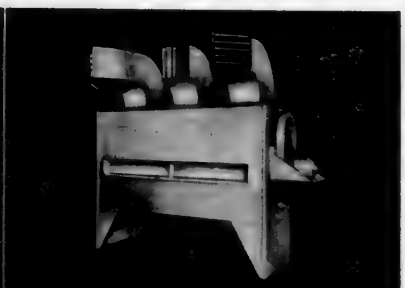
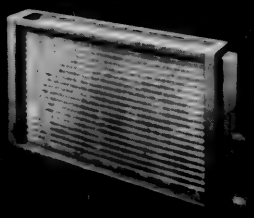


SPEEDHEATERS... Gas, steam and hot water types. Ideal for uniform space heating with rapid air circulation.



INDUSTRIAL HEATERS... The steam unit heater for industrial plants, warehouses, garages. Floor, wall, and ceiling mounting with adjustable nozzle outlets.

SILENTVANE FANS... Non-overloading horsepower characteristics with stable, quiet operation.



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J-80456

NEW CATALOGS

(Concluded from page 166)

WINTER HEATING PROBLEMS — A 16-page booklet (Bulletin No. F-1575) describing and illustrating the applications of electric heating in solving winter industrial headaches is available from Edwin L. Wiegand Co., Pittsburgh, Pa. Such jobs as warming pipes and valves, preventing condensation, warming materials, melting ice and snow, heating fluids, comfort heating, and other typical winter heating problems are discussed. ..... **Item 78**

SOLENOID PILOT INFORMATION — A 4-page bulletin describing several types of solenoid pilots for use with regulating valves is offered by Spence Engineering Co., Inc., Walden, N. Y. The bulletin lists reasons for economies in on-off control, describes applications, and gives the type of pilot, material of construction, maximum pressure and maximum temperature for 2- and 3-way pilots in steam, air, gas, and liquid service. ..... **Item 79**

AIR METER BULLETIN — A bulletin on the recently developed push-button Anemotherm air meter is announced by Anemostat Corporation of America, New York, N. Y. The bulletin explains the operation of the meter and describes typical uses for it, in various types of systems. A number of photographs illustrates the control features of the unit and outline operating procedures. ..... **Item 80**

MOTEL HEATING—The application of the SelecTemp heating system to motels is covered by an eight-page bulletin (No. 5235) issued by Iron Fireman Mfg. Co., Cleveland, Ohio. The method of controlling room temperature and the advantages of combined steam and forced warm air heating provided by the system are outlined by both pictures and text. ..... **Item 81**

REPORT ON PUMP IMPELLERS—A report on recent findings with respect to the physical and chemical characteristics of non-metallic impellers for displacement pumps is set forth in a 4-page folder available from Eco Engineering Co., Newark, N. J. Synthetic elastomers, fluorocarbons, and resinous laminates are surveyed and the influences on them of chemicals, mechanical and thermal stresses, and other factors are reviewed to give a picture of the applicability of non-metallic materials in pump service. ..... **Item 82**

CENTRAL AIR CONDITIONING—The development and use of self-contained central station air conditioning are given comprehensive coverage in a 36-page booklet published by United States Air Conditioning Corp., Minneapolis, Minn. The publication traces the history of comfort cooling in non-technical terms from the days of the Romans, and, in discussing the basic components of central air conditioning, it describes the operation of the refrigeration cycle and its application in built-up systems and in packaged air conditioners. ..... **Item 83**

Use the prepaid postcard on page 155 for securing your copies of catalogs described in this department.

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2,000 SERIES
(Illustrated)

All types of refrigeration applications use some kind of "sight glass." Precision-Built Allin LIQUID EYES—used by leading manufacturers and contractors—incorporate advanced design and improvements which keep refrigerant losses to an absolute minimum.

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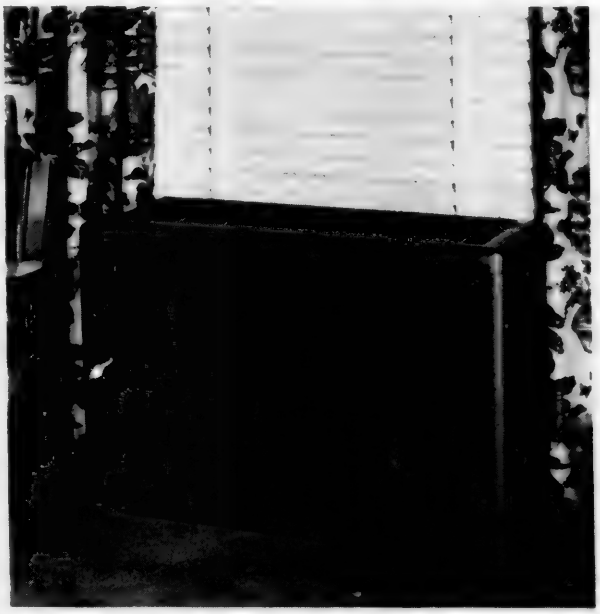

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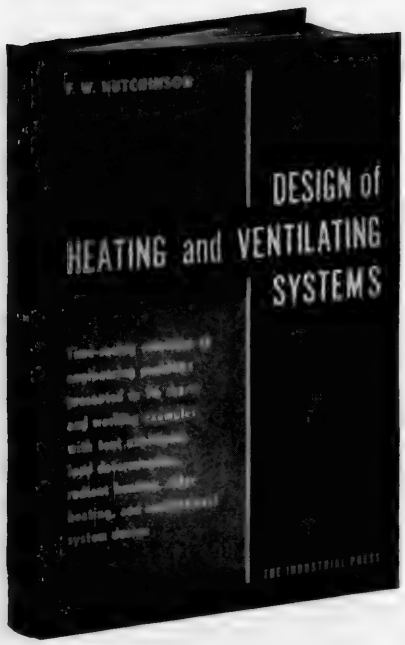

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- Ventilating and Humidification
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Opposite each graph is a design example and the solution illustrating the use of the method.

Explanatory text in each chapter clearly explains the engineering background and the mathematical basis of each graphical solution. Basic handbook data are also included so that, with the simple insertion of field data, design situations can be analyzed. Another important feature of the book is the inclusion of complete data for systems designed to utilize partial solar heating through the use of large picture windows. This is the first text on heating to include engineering data on this increasingly important subject.

The author is Professor of Mechanical Engineering at the University of California. He is the author of "Industrial Heat Transfer" and co-author of a number of books on panel heating, refrigeration and air conditioning. His knowledge of the field is well grounded on practical experiences as well as theory, as he acts as consultant for many industrial firms.

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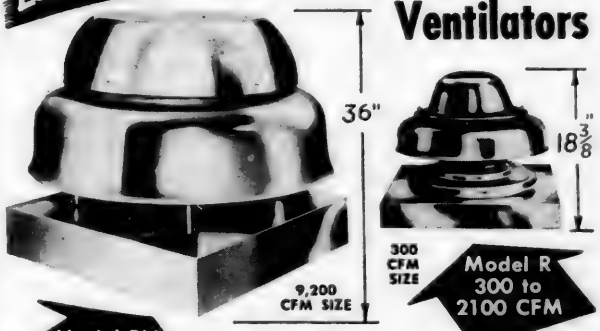

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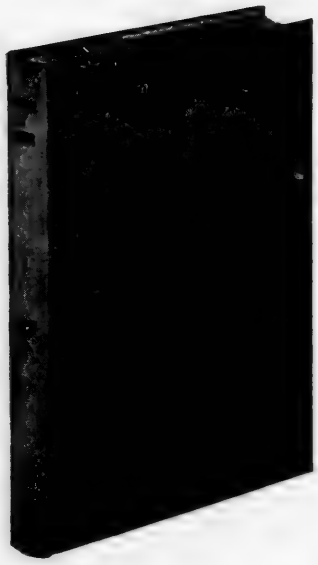

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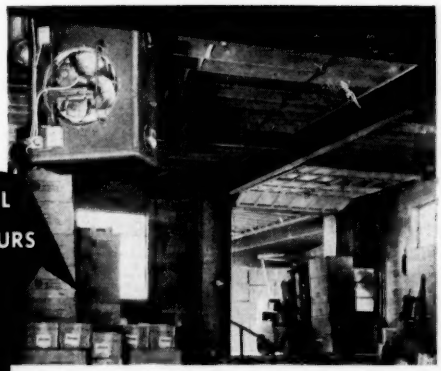

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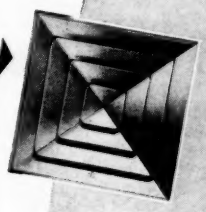

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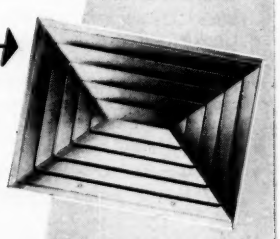

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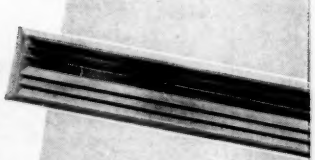

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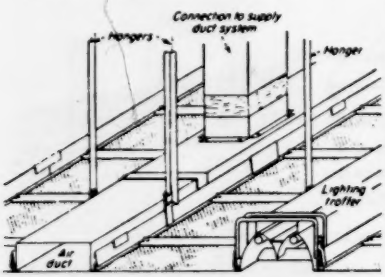

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ALPHABETICAL INDEX OF ADVERTISERS

A

Air Devices, Inc. 173
Air Filter Corp. 171
Air-Maze Corp. 34
Airtemp Construction Corp. 60
Airtherm Manufacturing Co. 169
Allen-Bradley Co. 28
Allen, W. D., Manufacturing Co.. 135
Allin Manufacturing Co. 169
Allis-Chalmers Manufacturing Co. 42
American Air Filter Co., Inc..12-13-141
American Blower Corp. 46
American Gilsonite Co. 51
American Machine & Metals, Inc. 1
Anemostat Corp. of America 39
Armstrong Machine Works Inside Front Cover

B

Babcock & Wilcox Co., Boiler Div. 59
Barber-Colman Co. 48
Bell & Gossett Co. 43-49
Bethlehem Steel Co. 30
Bishop & Babcock Mfg. Co., Massachusetts Blower Div. ... 75
Boiler Engineering & Supply Co., Inc. 164
Buffalo Forge Co. 65
Bush Manufacturing Co. 31

C

Carrier Corp. 26-27-135
Chase Brass & Copper Co. 36
Clarage Fan Co. ....Inside Back Cover
Classified Advertisements 172
Cleaver-Brooks Co., Boiler Div. .. 45
Combustion Engineering, Inc. ... 16
Connor Engineering Corp. 165
Cook, Loren, Co. 171
Copeland Refrigeration Corp. 127
Crane Co. 50

D

Davis Engineering Corp. 167
Debothezat Fans Div., American Machine & Metals, Inc. 1
Delta Heating Corp. 173
Dollinger Corp. 149
Dunham, C. A., Co. 125-131
Duriron Co., Inc. 153
Dwyer, F. W., Mfg. Co. 173

E

Elgen Manufacturing Corp. 162
Elliott Co., Crocker Wheeler Div. ..24-25
Engel Sheet Metal Equipment Co., Inc. 131

F

Farr Co. 58
Field Control Div., H. D. Conkey & Co. 64
Flexaust Co. 165
Frick Company 54

G

General Chemical Div., Allied Chemical & Dye Corp. 9
Gustin-Bacon Manufacturing Co. . 57

H

Halstead & Mitchell 41
Hoffman Specialty Mfg. Corp. ... 61

I

Illinois Engineering Co. 74
Illinois Testing Laboratories, Inc. . 160
Industrial Press 170
Industrial Sound Control, Inc. 71
Infra Insulation, Inc. 7
Iron Fireman Manufacturing Co. . 129

J

Jenkins Bros. 21
Johnson Service Co. .. ....Back Cover
Joy Manufacturing Co. 72

K

Kewanee Boiler Div., American-Standard 68
Korfund Co., Inc. 166
Kramer Trenton Co. 147

L

L. O. F. Glass Fibers Co. 70
Lawler Automatic Controls, Inc. . 62

M

Marley Co. 32-33
Marlo Coil Co. 137
Marsh Heating Equipment Co. ... 66
McDonnell & Miller, Inc. 67
Minneapolis-Honeywell Regulator Co. 14-15-22-23
Modine Manufacturing Co. 52
Mueller Climatrol 63

N

Nash Engineering Co. 76
Nesbitt, John J., Inc. 11
Niagara Blower Co. 152

O

Olson, Arthur A. & Co. 154

P

Patterson-Kelley Co., Inc. 159
Peerless Electric Co. 44
Petro 139
Pittsburgh Plate Glass Co. 133
Powers Regulator Co. 47

R

Reading Tube Corp. 29
Revere Copper & Brass, Inc. 123
Reznor Manufacturing Co. 151
Ric-wil, Incorporated 40
Richmond Engineering Co., Inc. .. 35

S

Sarco Co., Inc. 145
Sarcotherm Controls, Inc. 53
Simplex Ceiling Corp. 174
Skidmore Corporation .....Insert 55-56
Smith, H. B., Co., Inc. 73
Spraying Systems Co. 169
Stillwater Clay Products Co. 163
Sturtevant Div., Westinghouse Electric Corp. 168

U

Universal Diffuser Corp. 167

W

Want Advertisements 172
Watts Regulator Co. 4
Webster, Warren & Co. 2
Weil Pump Co. 131
Westinghouse Electric Corp., Sturtevant Div. 168
Wiegand, Edwin L., Co. 171
Worthington Corp. **143**

Y

York Corp. 161
Youngstown Sheet & Tube Co. 69

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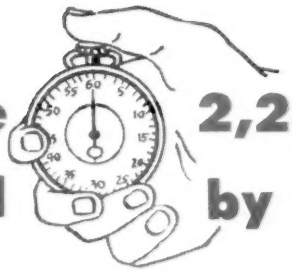

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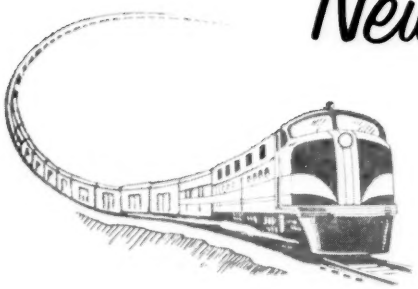

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